Third Five-Year Review Report

For
SCRDI Bluff Road
Richland County, South Carolina

September 2013

Prepared by:

U.S. Environmental Protection Agency – Region 4
Atlanta, Georgia

and

South Carolina Department of Health and Environmental Control
Columbia, South Carolina

Approved by: _____ Date: 9/25/13
Franklin E. Hill
Director, Superfund Division

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List of Acronyms and Abbreviations

1990 ROD	Record of Decision
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Above Ground Storage Tank
BGS	Below Ground Surface
BRA	Baseline Risk Assessment
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminants of Concern
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FT	Feet
FYR	Five-Year Review
GPM	Gallons Per Minute
GWCG	Groundwater Cleanup Goals
GWETS	Groundwater Recovery System
ICs	Institutional Controls
MDL	Method Detection Limit
MCL	Maximum Contaminant Level
MG/KG	Milligrams per Kilograms
MSL	Mean Sea Level
MW	Monitoring Well
NCP	National Contingency Plan
ND	Non-Detect
NPL	National Priorities List
O&M	Operation and Maintenance

List of Acronyms and Abbreviations (con't)

OM&M	Operation, Maintenance and Monitoring
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PCBs	Polychlorinated Biphenyls
PLC	Programmable Logic Control
Ppb	Parts Per Billion
PRP	Potentially Responsible Party (Performing Settlors)
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RW	Recovery Well
SDWA	Safe Drinking Water Act
SCDHEC	South Carolina Department of Health and Environmental Control
SCRDI	South Carolina Recycling and Disposal Inc.
SVE	Soil Vapor Extraction
SVOC	Semi-volatile Organic Compound
TBC	To-Be-Considered
UG/L	Micrograms per Liter
USACE	United States Army Corps of Engineers
VI	Vapor Intrusion
VOC	Volatile Organic Compound

Executive Summary

The SCRDI Bluff Road Site (the Site) is located in Richland County, South Carolina about ten miles south of Columbia along State Highway 48, also known as Bluff Road. The Site area includes the 4-acre parcel leased by South Carolina Recycling and Disposal Inc. (SCRDI) and the Access Area, property which by access agreement with property owners, has allowed the Performing Settlors to complete investigations and to remediate groundwater impacts. SCRDI operations were generally limited to the southern half of the 4-acre parcel leased by SCRDI.

The Site is located in a rural area. The nearest residence lies about one mile away. Approximately 3,500 people live within 4 miles of the Site. About 1,200 people work immediately across the street from the Site at the Westinghouse Nuclear Fuels Facility. The Site and nearby properties are rural and wooded. Property uses for adjacent properties to the Site include hunting and timber production, with the exception of the heavy industrial development at the Westinghouse Nuclear Fuels Facility.

The first reported commercial or industrial use of the Site was as an acetylene gas manufacturing facility. Two lagoons were constructed at the north end of the Site to support acetylene manufacturing. Specific dates and other details regarding the facility operations are not available. In 1975, the Site became a marshalling center for the Columbia Organic Chemical Company. Site records indicate that the operator used the title SCRDI beginning in 1976, as the Site was intended to store, recycle, and dispose of chemical wastes from a variety of sources. The Site was operated by SCRDI, as a waste storage, recycling, and disposal facility for waste chemicals from 1976 to 1982. The waste chemicals were stored at the Site in drums. Cleanup of the site surface was conducted in 1982 and 1983 under the direction of the South Carolina Department of Health and Environmental Control (SCDHEC). Over 7,500 drums containing chemicals and numerous smaller containers of toxic, flammable, and reactive wastes were stored on the site from 1975 until it was closed in 1982; these containers were removed for proper disposal. Visibly contaminated soil and all above-ground structures were also removed and clean fill material was used to fill excavations and provide clean access road surfaces.

The initial soil and groundwater samples as well as the surficial clean-up indicated substantial contamination of soils and groundwater by the hazardous waste operations of SCRDI. Following a surficial cleanup in 1982 and 1983, groundwater and soil contamination remained at significant levels. Major soil contaminants included: acetone, chloroform, toluene, chlorobenzene, 1,1,2,2-tetrachloroethane, and tetrachloroethane. Significant groundwater contaminants included: acetone, 1, 1-dichloroethane, 1, 2-dichloroethene, chloroform and other volatile organic compounds (VOCs). In September 1983, the Site was listed on the National Priorities List (NPL).

The Remedial Investigation/Feasibility Study (RI/FS) was finalized in March of 1990, and indicated cleanup alternatives for remaining soil and groundwater contamination. Under the United States Environmental Protection Agency (EPA) oversight, a pilot scale test of the Soil Vapor Extraction (SVE) system was conducted at the Site in July and August 1990. A Record of Decision (ROD) was signed for the Site by the EPA on September 12, 1990. The primary components of the 1990 ROD included SVE as the recommended remedial alternative for soils and groundwater extraction and treatment as the recommended alternative for groundwater.

Construction of the soil remedy was started and completed in 1994. The soil cleanup goals were achieved in late 1996. The EPA approved the soil remedy as complete in March 1997 and the system was removed from the Site by early April 1997. The groundwater recovery system (GWRS) at the Site was constructed in 1996 and operation began in August 1996.

As of August 2013, the operation of the groundwater recovery system has continued within permit levels for air emissions and treated water quality for groundwater injection.

Analytical results indicate the GWRS is functioning satisfactorily. As of November 30, 2012, approximately 928 million gallons of groundwater have been recovered, treated and re-injected since system startup. Approximately 4,043 pounds of VOCs have been effectively removed and treated within discharge limits.

The operation of GWRS has resulted in the improvement of groundwater quality at the Site. Based on analysis summarized in the "*Review of Ground Water Recovery System Performance, SCRDI Bluff Road Site, Columbia, South Carolina*" Report, the VOC mass in the plume has decreased by approximately 94% since startup of the GWRS.

Therefore, the remedies selected for the SCRDI Bluff Road Site are protective in the short term since there is no complete exposure pathway to contaminated groundwater and the GWRS is functioning as intended by the 1990 ROD.

For the remedy to be protective in the long term, the following actions should occur:

- An appropriate decision document should be prepared to include appropriate institutional controls.
- Performing Settlors should secure appropriate access from property owners for the duration of the remedial action.
- Evaluate the need for institutional controls (ICs) on properties adjacent to the Site.
- Current metal analysis should be obtained to ensure the remedy is still protective for the metal contaminants.
- Evaluate the level of protectiveness and determine whether the 1990 ROD cleanup goals established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2-Tetrachloroethane, 4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese and Zinc remain within the acceptable risk range.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: SCRDI Bluff Road		
EPA ID: SCD000622787		
Region: 4	**State:** SC	**City/County:** Columbia, Richland County

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: U.S. EPA, Region 4 and the South Carolina Department of Health & Environmental Control (SCDHEC)
Author name: Yvonne Jones and Charles Williams
Author affiliation U.S. EPA, Region 4 and SCDHEC
Review period: October 30, 2012 to August 26, 2013
Date of site inspection: October 30, 2013
Type of review: Policy
Review number: 4
Triggering action date: 9/30/2008
Due date *(five years after triggering action date)*: 9/29/2013

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	**Issue Category: Institutional Controls**			
	Issue: The 1990 ROD did not require ICs. ICs are necessary because there are no restrictions on the Site to prevent exposure to contaminated groundwater other than SCDHEC's well permit requirements for new installations and an access agreement that may expire in December 2013.			
	Recommendation: An appropriate decision document should be prepared to include appropriate institutional controls.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	09/30/2015
OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: The access agreement may expire in December 2013.			
	Recommendation: Performing Settlors should secure appropriate access from property owners for the duration of the remedial action.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	09/30/2014
OU(s): 1	**Issue Category: Institutional Controls**			
	Issue: ICs may be needed on properties adjacent to the Site.			
	Recommendation: Evaluate the need for ICs on properties adjacent to the Site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	09/30/2014
OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: Metal Analysis were discontinued in 1995.			
	Recommendation: Current metal analysis should be obtained to ensure the remedy is still protective for the metal contaminants.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	09/30/2014

Five-Year Review Summary Form (continued)

OU(s): 1	Issue Category: Remedy Performance			
	Issue: No Federal or South Carolina Primary MCL has been established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane, 4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese or Zinc.			
	Recommendation:. Evaluate the level of protectiveness and determine whether the 1990 ROD cleanup goals remain within the acceptable risk range.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	PRP	EPA/State	03/30/2014

Protectiveness Statement(s)

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
1	Short-term Protective	

Protectiveness Statement:

The remedies selected for the SCRDI Bluff Road Site are protective in the short term since there is no complete exposure pathway to contaminated groundwater and the GWRS is functioning as intended by the 1990 ROD.

For the remedy to be protective in the long term, the following actions should occur:

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- Evaluate the level of protectiveness and determine whether the 1990 ROD cleanup goals established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane, 4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese and Zinc remain within the acceptable risk range.

Sitewide Protectiveness Statement (if applicable)

Protectiveness Determination:	*Addendum Due Date (if applicable):*
Short-term Protective	

The remedies selected for the SCRDI Bluff Road Site are protective in the short term since there is no complete exposure pathway to contaminated groundwater and the GWRS is functioning as intended by the 1990 ROD.

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Five-Year Review Summary Form (continued)

Environmental Indicators
- Current human exposures at the Site are under control. - Current ground water migration is under control.
Are Necessary Institutional Controls in Place?
☐ All ☐ Some ☒ None *The ROD does not require institutional controls. Institutional controls restricting ground water and land use at the Site are needed to ensure that remedial actions at the Site will remain protective of human health and the environment.*
Has the EPA Designated the Site as Sitewide Ready for Anticipated Use?
☐ Yes ☒ No
Has the Site Been Put into Reuse?
☐ Yes ☒ No

1.0 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

The EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."

The EPA, Region 4 and the South Carolina Department of Environmental Control (SCDHEC) conducted the FYR and prepared this report regarding the remedy implemented at the SCRDI Bluff Road Site (the Site) in Richland County, South Carolina. The EPA and SCDHEC conducted this FYR for the entire site from October 2012 to August 2013. The EPA is the lead agency for developing and implementing the remedy for the potentially responsible party (PRP)-financed cleanup at the Site. SCDHEC, as the support agency representing the State of South Carolina, has reviewed all supporting documentation and provided input to the EPA during the FYR process. The SCRDI Bluff Road PRP Group (Performing Settlors) funds, performs and manages the environmental response activities at the Site. de maximis, inc., O&M, Inc. and Services Environmental, Inc. on behalf of the PRP Group, implements operation, maintenance and monitoring activities as well as conducts data collection and analyses detailed in this report. This FYR references, extracts, summarizes, and/or edits information from the SCRDI Bluff Road Site documents provided in Appendix A. This report documents the results of the review.

This is the third FYR for the Site. This is considered a 'policy' Five-Year Review because the selected remedy for groundwater, upon completion, will not leave hazardous substances, pollutants, or

contaminants remaining on Site above levels that allow for unlimited use and unrestricted exposure, and the remedial action requires more than five years or more to complete. The trigger for this policy review is the passage of five years since the completion of first Five-Year Review report. The Site consists of one operable unit (OU).

2.0 Site Chronology

Table 1 lists the dates of important events for the SCRDI Bluff Road Site.

3.0 Site Background

3.1 Physical Characteristics

The Site is located in Richland County, South Carolina about ten miles south of Columbia along State Highway 48, also known as Bluff Road. Figure 1 shows the general site location. Figure 2 presents a map of the Site area. The Site area includes the 4-acre parcel leased by South Carolina Recycling and Disposal Inc. (SCRDI) and the Access Area, property which by access agreement with property owners, has allowed the Performing Settlors to complete investigations and to remediate groundwater impacts. SCRDI operations were generally limited to the southern half of the 4-acre parcel leased by SCRDI. Figure 2 shows the locations of the recovery and injection wells.

The Site is a rectangular parcel of land measuring 133 feet of frontage on Bluff Road and extends back approximately 1,300 feet from the road. The Site is relatively level with ground elevation varying from approximately 139 feet near the highway to 134 feet above mean sea level at the rear of the property. The front portion of the Site extending approximately 600 feet from the road is cleared and has been used for various industrial and commercial purposes. The Site is directly across Bluff Road from the entrance to the Westinghouse Nuclear Fuel Facilities where nuclear fuel assemblies are fabricated for commercial nuclear reactors.

The Site and surrounding area soils identified by the Richland County Soil Survey include loams, which are mixtures of sand, silt and clay. The specific soil types that exist at the Site and the vicinity are the Orangeburg loamy sand, Persanti fine sand loams, Smithboro loam, and Cantry loam. Most of the nearby property and rear portions of the Site, as well as the surrounding properties, have been classified by the United States Army Corps of Engineers (USACE) as wetlands. Surface water flow from the Site property and the adjacent study area is directed to one of two main drainage channels; a drainage ditch parallel to Bluff Road that is a tributary to Myers Creek, and Myers Creek itself. Groundwater flow is to the south-southeast.

The stratigraphy of the Site area can be summarized into four hydrologically connected water-bearing units. The hydrogeologic units are described as follows:

- A shallow, surficial aquifer in the Okefenokee terrace, underlain by a clay aquitard, part of the Black Creek Formation
- A deep aquifer consisting of sand and clay, also part of the Black Creek Formation, underlain by another aquitard and sandy clay
- The deepest aquifer, the Middendorf Formation, consisting of sand, silt, and clay (commonly referred to as the Tuscaloosa Aquifer)

- The crystalline pre-Mesozoic basement which has virtually no primary porosity but possibly has significant high secondary fracture porosity.

The shallow aquifer typically extends to a depth of 45 to 50 feet below ground surface (bgs) and is composed primarily of sand with varying amounts of silt and clay, and sorting ranges from well to poor. This aquifer is classified as a potable aquifer by the State of South Carolina. The shallow aquifer is semi-confined by a silt and clay layer that ranges in maximum depth of 5 to 15 feet bgs. The water table in the shallow aquifer general exists 10 to 15 feet bgs. The overall groundwater flow is generally to the southeast and south.

The deep aquifer is separated from the shallow aquifer by a clay and silt unit, which ranges in thickness from 1.5 to 25 feet bgs. This partial confining unit is thinnest in the vicinity of MW-6 and MW-7 and thickens to the south and west (Figure 3). The lithology of the deep aquifer is similar to that of the shallow aquifer, though clay-rich layers are more common. Both the clay aquitard and the deep aquifer are thought to be units in the Black Creek Formation. The gradient of the shallow aquifer potentiometric surface is about 0.003 near Bluff Road and changes to less than 0.001 in the vicinity of MW-4, MW-6, MW-8, and MW-1 (Figure 3). The Remedial Investigation (RI) data indicate that there is a downward head in the surficial aquifer and it could recharge the deeper aquifer. Flow patterns of the shallow aquifer water table are subject to local influences. The gradient of the potentiometric surface in the deep aquifer is 0.0003 ft/ft toward the south based on water level data gathered from the four wells installed by the IT Corporation.

Although not typically included as part of the Site by earlier documents, the Site also effectively includes the adjacent, and similarly dimensioned, 4-acre parcel. The shallow soils on this property were contaminated and were part of the soils remediation. This parcel is also the location of a recovery well and the location of the present groundwater treatment system building for the ongoing groundwater remediation.

3.2 Land and Resource Use

The Site is located in a rural area. The nearest residence lies about one mile away. Approximately 3,500 people live within 4 miles of the Site. About 1,200 people work immediately across the street from the Site at the large Westinghouse Nuclear Fuels Facility.

The Site and nearby properties are rural and wooded. Property uses for adjacent properties to the Site are currently for hunting and timber production, with the exception of the heavy industrial development at the Westinghouse Nuclear Fuels Facility.

The residents in Hopkins, SC along Lower Richland Boulevard and along Bluff Road, south of the Site rely on groundwater wells for water use. All the private residential wells closest to the Site in the community of Hopkins, along Lower Richland Boulevard, were sampled in 1994. The private residential wells along the south side of Bluff Road, and near Lower Richland Boulevard, were sampled in 1996. The data for all the private residential well samples shows that Site groundwater contaminants have not migrated to the residential wells.

3.3 History of Contamination

The first reported commercial or industrial use of the Site was as an acetylene gas manufacturing facility. Two lagoons were constructed at the north end of the Site to support acetylene manufacturing. Specific dates and other details regarding the facility operations are not available. In 1975, the Site became a marshalling center for the Columbia Organic Chemical Company. Site records indicate that the operator used the title SCRDI beginning in 1976, as the Site was intended to store, recycle, and dispose of chemical wastes from a variety of sources. The Site was operated by SCRDI, as a waste storage, recycling, and disposal facility for waste chemicals from 1976 to 1982. The waste chemicals were stored at the Site in drums. Cleanup of the Site surface was conducted in 1982 and 1983 under the direction of the and SCDHEC. Over 7,500 drums containing chemicals and numerous smaller containers of toxic, flammable, and reactive wastes were stored on the Site from 1975 until it was closed in 1982; these containers were removed for proper disposal.

3.4 Initial Response Action

In March 1980, the EPA conducted a site visit and saw a number of leaking storage drums. Samples of the drums contents and adjacent surficial soils were collected and analyzed. The analyses showed the presence of volatile organic and other chemical compounds. An investigation of groundwater quality was performed by the SCDHEC in the fall of 1980. Results of the investigation indicated that groundwater had been impacted by the chemical releases. Chlorinated organic solvents and lead were detected in the groundwater in 1980 and sampling of groundwater in 1982 indicated that concentrations of organic compounds in groundwater were increasing. Operations at the SCRDI Site were shut down in 1982.

3.4.1 Surficial Cleanup

Cleanup of the Site surface was conducted in 1982 and 1983 under the direction of SCDHEC. Over 7,500 drums containing chemicals and numerous smaller containers of toxic, flammable, and reactive wastes were stored on the Site from 1975 until it was closed in 1982; these containers were removed for proper disposal. Visibly contaminated soil and all above-ground structures were also removed and clean fill material was used to fill excavations and provide clean access road surfaces.

3.5 Basis for Taking Action

The initial soil and groundwater samples as well as the surficial clean-up indicated substantial contamination of site soils and groundwater by the hazardous waste operations of SCRDI. Following a surficial cleanup in 1982 and 1983, groundwater and soil contamination remained at significant levels. Soil contaminants included: acetone, chloroform, chlorobenzene, toluene, 1,1,2,2-tetrachloroethane, and tetrachloroethane. Significant groundwater contaminants included: acetone, 1, 1-dichloroethane, 1,2-dichloroethene, chloroform and other VOCs. In September 1983, the Site was listed on the National Priorities List (NPL). The NPL is a list of priority releases for long-term evaluation and remedial response, and was promulgated pursuant to section 105 of the CERCLA of 1980: The NPL is found in the NCP, Appendix B of 40 CFR part 300.

3.6 Summary of Site work leading to Soil and Groundwater Remedial Actions

Initial Remedial Investigation

RI work begun in 1984. In 1986, Golder Associates was retained by SCDHEC to conduct a RI to determine the type, extent, and degree of soil and groundwater contamination on and around the Site. The investigation included soil and groundwater sampling, a soil gas survey, and a subsurface geophysical survey. The extent of groundwater contamination was investigated by installing 25 monitoring wells and drilling 10 borings for organic vapor analysis. Assessment of contaminants in the above ground storage tank (AST), soil, lagoon-water and groundwater samples indicated 2-chlorophenol and phenol in the AST and VOCs in vadose zone soils. Both samples from the lagoon indicated that VOCs were not detected in concentrations that exceeded the method detection limit (MDL). Of the 25 monitoring wells, three of the monitoring wells were screened in deep strata that underlie the black plastic clay. Water sample analyses from the three deep wells, installed below the clay aquitard, indicated that VOCs were not detected above the respective maximum contaminant levels (MCLs). The 22 wells installed in the surficial sand aquifer, indicated that contamination was present throughout the thickness of the aquifer and was entirely VOCs, concentrations ranging from the MCL to 10,238 parts per billion (ppb).

Final Remedial Investigation and Feasibility Study

In 1989, the RI was continued and involved the sampling of soil, surface water, sediments, groundwater, and air. Sampling was conducted to define the characteristics and extent of contamination at the Site. Nineteen monitoring wells were installed in the surficial aquifer to define the extent and characteristics of groundwater contamination. The analytical results defined a contaminant plume approximately 1,000 feet wide extending approximately 2,200 feet southeast of the Site.

Four monitoring wells were installed during the RI in the upper portion of the deep aquifer, below the clay aquitard. Analytical results of water extracted from these deep wells indicated that the deep aquifer had not been impacted by contamination. Based on the analysis of forty-two surface soil samples collected during the RI, two general areas of surface soil contamination were identified. The most significant area of surface soil contamination was found on the southwestern edge of the Site and encompassed approximately 350 feet x 200 feet (70,000 square feet). The second area of surface soil contamination was identified in the central portion of the SCRDI property (the dry lagoon area) at lower concentrations than those detected at the southwestern edge of the property. This second area encompassed approximately 100 feet x 100 feet (10,000 square feet).

Twenty-nine soil borings were sampled on and off the Site to determine the extent of vadose zone contamination. Analytical results showed that elevated levels of VOCs were limited to the upper 7 feet of the unconsolidated zone with concentrations decreasing significantly with depth. The areas of detected elevated levels encompassed an area of approximately 400 feet x 250 feet (112,500 square feet), which overlapped the area of high contaminant concentrations in surface soil. In addition semi-volatile organic compounds (SVOCs) were detected in the same limited areas, and low levels of pesticides/polychlorinated biphenyls (PCBs) were detected in the subsurface soils. The wet lagoon-water and sediment samples contained trace amounts of VOCs and SVOCs. Sediment metal concentrations were within background ranges with the exception of calcium. Samples of off-site surface water and surface water sediment indicated no Site related contamination. Ambient air samples were also collected at the Site. Toluene was detected

in two out of three bag samples at concentrations of 22 and 27 ppb. No other constituents were detected; air contamination was determined not to be significant at the site.

The RI/FS was finalized in March of 1990, and indicated cleanup alternatives for remaining soil and groundwater contamination. In May 1990, the EPA issued a Proposed Plan for the cleanup of the Site. The Proposed Plan recommended thermal desorption for the cleanup of contaminated soils remaining at the Site, and extraction and treatment for contaminated groundwater. During the public comment period on the Proposed Plan, comments were received that supported a different alternative, a Soil Vapor Extraction (SVE) system to clean-up the soils. Under the EPA oversight, a pilot scale test of the SVE system was conducted at the Site in July and August 1990. The pilot test demonstrated that SVE was a feasible remedial technology for this Site and was capable of achieving the required target soil cleanup goals set in the ROD for the vadose zone. Concerns about the amount of clay in Site soils and the effectiveness of SVE were satisfactorily addressed.

In addition to specifying SVE as the preferred alternative for treatment of the contaminated soils at the Site, the ROD specifies two options for the treatment of the extracted vapors. The ROD specifies that the extracted vapors will be run through a vapor/liquid separator and then finally treated either with vapor phase carbon adsorption, or by fume incineration.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with Applicable or Relevant and Appropriate Requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(f)(5)(i) of the NCP. The nine criteria include:

1. Overall Protectiveness of Human Health and the Environment,
2. Compliance with ARARs,
3. Long-Term Effectiveness and Permanence,
4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment,
5. Short-term Effectiveness,
6. Implementability,
7. Cost,
8. State Acceptance, and
9. Community Acceptance.

4.1 Remedy Selection

The selected remedy for the Site remediation addressed two areas:

- Remediation of site soils, and
- Remediation of the site and off-site shallow groundwater acquifer

A ROD was signed for the Site by the EPA on September 12, 1990. The primary components of the 1990 ROD included SVE as the recommended remedial alternative for soils and groundwater extraction and treatment as the recommended alternative for groundwater.

An Explanation of Significant Differences (ESD) was signed in March of 1991. The 1991 ESD determined that a FYR was applicable for the Site, because soil and groundwater will be contaminated above health-based risk levels until the remedy, projected to take two years from the 1990 ROD for contaminated soil remediation and sixteen years for groundwater remediation, is fully implemented and deemed successful.

Shortly thereafter, the EPA negotiated with over one hundred PRPs. The result of the negotiations was a Consent Decree (CD) whereby Performing Settlors' agreed to pay site cleanup and the EPA oversight costs. At the beginning of remediation, litigation with adjacent property owners over access to property surrounding the Site caused significant delays.

4.1.1 Soils

Soil Remediation Established Clean-up Levels

The chemical-specific soil target cleanup goals established in the 1990 ROD are presented in Table 2. This table is equivalent to Table 14 of the 1990 ROD.

Soil Remediation - Soil Vapor Extraction (SVE)

An SVE System was selected as the soil remedy upon completion of the Site pilot test in 1990. The SVE system included a network of vacuum (air withdrawal) wells in the shallow unsaturated zone. A large air vacuum pump applied a vacuum through a PVC pipe manifold system to the series of wells to remove the organic compounds from the Site soils.

The Performing Settlors submitted a draft design for the SVE system on September 3, 1993, in accordance with requirements of the Consent Decree. The EPA and SCDHEC reviewed the design and forwarded comments. Of the two options identified in the 1990 ROD for SVE vapor treatment, the draft design and its revisions selected incineration of the extracted vapors by a catalytic oxidizer, or CATOX unit. The pilot test demonstrated that SVE was a feasible remedial technology for this Site and was capable of achieving the required target soil cleanup goals set in the ROD in the vadose zone. Concerns regarding the amount of clay in site soils and the effectiveness of SVE were satisfactorily addressed.

4.1.2 Groundwater

Groundwater Established Cleanup Levels

The groundwater cleanup goals are based on Safe Drinking Water Act (SDWA) MCLs or on risk-based criteria assuming groundwater use as a drinking water supply. The Groundwater Cleanup Goals (GWCGs) were established for 22 VOCs and eleven metals. The GWCGs are detailed in Table 13 of the 1990 ROD and listed in Table 3.

The most limiting of these goals are those for 1,1,2,2-tetrachloroethane (0.6 µg/L), carbon tetrachloride (5 µg/L) and tetrachoroethene (5 µg/L), in that the attainment of GWCGs for these three VOCs defines the limit of the VOC plume.

Groundwater Recovery System

A system of recovery wells was selected to pump the contaminated groundwater back to a treatment building where the contaminated groundwater was cleaned to drinking water standards. In accordance with SCDHEC's Underground Injection Control Permit, treated groundwater would be re-injected into the groundwater, upgradient from the Site.

Groundwater treatment of the extracted groundwater would include Air-stripping, and liquid phase granular activated carbon (GAC) system.

Groundwater remediation will be performed until all contaminated water meets the cleanup goals. The 1990 ROD noted that the purpose of remedial action at the Site is to mitigate and minimize contamination in groundwater, and to reduce potential risks to human health and the environment. The following clean-up objectives were determined based on regulatory requirements and levels of contamination found at the Site; these goals of system operation are outlined below and in Section 1.4 of the O&M Plan:

- Recovery of groundwater through a system consisting of eight groundwater recovery wells;
- Capture groundwater to contain the Site VOC plume down-gradient to MW-21B and southwest to Bluff Road;
- Operate the system in a manner that is efficient, safe and protective of human health and the environment;
- To prevent off-site movement of contaminated groundwater;
- Treat groundwater to meet the discharge limits established by the SCDHEC Underground Injection Control Permit;
- Treatment of groundwater by air stripping of VOCs, pumping through a duplex basket filter to remove suspended solids, by removing any remaining VOCs by capturing with granular activated carbon;
- Injection of the treated groundwater to the aquifer in a series of 10 wells, which are located upgradient of the contaminant plume in a northwesterly direction from the treatment plant; and
- Treating air emissions from volatilization as needed to meet ambient air quality standards
- Monitoring groundwater and air on-site.
- To restore contaminated groundwater to levels protective of human health and the environment;
- Attain the Groundwater Cleanup Criteria established in the 1990ROD

Groundwater Remedial Design Investigation

Environmental Resources Management, Inc. (ERM) performed a Remedial Design (RD) Investigation to collect the data necessary to design a groundwater remediation system for the Site and adjacent area (Figure 4). The results of the RD investigation indicated the following:

- A design consisting of recovery wells along the plume and re-injection wells up-gradient of the capture zone was preferred. There is no data to indicate that the aquitard is absent from any portion of the site or adjacent area.
- Additional monitoring wells would be needed (and have been installed) down-gradient of the recovery wells to verify the plume limits and provides sentinel wells for monitoring during recovery and treatment efforts.

- Solute transport modeling demonstrated that the elapsed time for down-gradient cleanup might be achieved in as short as ten years, assuming no continuing source of VOCs.
- The air stripper and activated, carbon treatment of organic compounds is predicted to result in discharge of effluent below MCL concentrations, and thus will not degrade groundwater quality when re-injected into the surficial aquifer.

Metals concentrations are likewise expected to be less than the GWCG or background concentrations. The analysis of total and dissolved metals results indicated that only three monitoring wells had concentrations that exceeded a GWCG and significantly exceeded background quality for a metal (manganese or iron, which are secondary standards for taste and odor).

There was an additional groundwater sampling event for metal analysis in February 1995. The additional sampling indicated that none of the metals exceed the Target Cleanup Levels except iron and manganese, which are naturally occurring according to background data. The additional groundwater sampling data is detailed in the Supplemental Ground Water Investigation Report, April 19, 1995 prepared by ERM, Inc.

The GWRS construction was completed in August 1996. Operation of the GWRS is ongoing.

4.2 Remedy Implementation

4.2.1 Soil Remedy Implementation

Construction of the soil remedy was started and completed in 1994. The soil cleanup goals were reached in late 1996. The EPA approved the soil remedy as complete in March 1997 and the system was removed from the Site by early April 1997. The SVE soil remedy was implemented and performed in accordance with the 1990 ROD and the approved remedial design criteria and specifications. Confirmatory vadose zone soil sampling verified that the 1990 ROD specified target cleanup goals have been achieved and that all soil remedy actions specified in the 1990 ROD have been implemented. Site soils have been eliminated as a continuing source of contamination via leaching to the surficial aquifer and pose no threat to human health and the environment.

The total post-ROD cost for the soils remediation effort was $1,770,000. This was the cost associated with the work by the SVE system contractor (Terra Vac, Inc). Refer to the SCRDI Bluff Road Site SVE Remedial System Soil Closeout Report, August 23, 1996, for more details concerning: SVE remedial system performance criteria; SVE system installation and construction activities; SVE systems operations and maintenance; pre and post-operations confirmatory sampling results; clean-up goal verification; cessation of SVE system operations; SVE well abandonment; and manifold dismantling and disposal.

4.2.2 Groundwater Remedy Implementation

The GWRS at the Site was constructed in 1996 and operation began in August 1996. The system consists of eight groundwater recovery wells (RW-1 to RW-8) and ten injection wells (IW-1 to IW-10) (Figure 4). All wells were installed in the shallow, unconfined, alluvial aquifer system. All of the extracted groundwater is treated by air stripping, then granular activated carbon, and then re-injected to the shallow aquifer via the ten injection wells.

As outlined in the Capture Zone Evaluation Report of April 1997 prepared by ERM, Inc., the plumes can be described in terms of a northern plume lobe or section and the southern plume section. The distinction between these plume sections is defined by the change in groundwater flow direction just south of RW-5 and is not related to a change in the chemical nature of the plume. Recovery wells RW-1 through RW-5 are located along the axis of the northern plume. Recovery wells RW-6 through RW-8 are located along Bluff Road at the southwest limit of the Site Access Area. These three wells were designed to perform as a picket line for hydraulic capture. Recovery wells RW-6 and RW-7, by themselves, could contain the limits of both the northern and southern plume sections, based on the balance between pumping rate and amount of groundwater flowing naturally in this area. The well pumps are submersible, centrifugal type located in the wells. The total planned startup recovery/injection pumping rates, as outline in the O&M Manual was 160 gallons per minute. The well pumps transfer the groundwater from the wells through a duplex basket filter into a 9,000-gallon influent equalization tank. From the equalization tank, a horizontal centrifugal pump transfers the water to two air strippers, in parallel, for removal of the bulk of VOCs. Effluent from the air strippers is transferred via a progressive cavity pump through a duplex basket filter and two granular activated carbon vessels, in series. The groundwater effluent, now fully treated to groundwater drinking standards by the air strippers and GAC vessels is re-injected into the groundwater.

The entire treatment system is housed inside a prefabricated metal building located approximately 400 feet from Bluff Road. A sump is cast into the floor of the building with an approximate working volume of 200 gallons and a permanent sump pump is in place. The sump pump discharges to the influent equalization tank. An electrical distribution panel and programmable logic controller (PLC) and alarm system are in the building. The treated groundwater is currently sampled monthly to satisfy the requirements of the SCDHEC groundwater re-injection permit

The Site groundwater is currently sampled semi-annually to monitor the effectiveness of the GWRS and the progress of the remediation of the contaminated groundwater.

4.3 System Operations and Maintenance (O&M)

As previously mentioned, the soils remediation is complete and the present system O&M consists of operating and maintaining the GWRS. The GWRS is currently maintained and operated by a qualified and certified operator from O&M, Inc. A site visit is usually made every day of the week, and on the weekends if necessary. The system is also capable of operating without daily inspection as the system design includes interlocks and safety devices that will shut down the system to prevent an accidental release and prevent damage to the equipment while operating unattended.

The instruments include level control to start and stop pumps, throttling valves to set system flow rate; flow measurement and recording; flow and pressure detection to detect upset conditions, and pressure relief devices in the event of upset conditions.

4.3.1 Permits for Ongoing Groundwater Remediation

The SCDHEC issued permit (No. 17,908-IW) for the construction of the site groundwater treatment system on 7 December 1995. According to the permit, the facility is classified in Group I-PC, requiring the operation of the system of a Grade D Operator.

The construction permit also provided for the submission of a Best Management Practices Plan to avoid and mitigate the release of toxic or hazardous substances as defined in Parts 117 and 122 of 40 CFR. The O&M Plan has a Best Management Practices Plan.

The SCDHEC approved the operation of 10 Class VA-I (aquifer remediation) injection wells at the referenced Site as per their inspection of April 15, 1996 and Injection Well Operating Permit #149M. It was required by the permit that the wells be operated in accordance with Supplemental Groundwater Sampling Report of April 19, 1995, the draft O&M manual submitted on February 29, 1996 and May 24, 1996 correspondence of de maximis, inc. to SCDHEC representatives.

The SCDHEC has subsequently approved a revised Injection Operating Permit #149M on March 6, 2007 which provided the same requirements as before except for the deletion of the requirement to analyze for 2 -chlorophenol, the only SVOC in the original permit. The SVOC compound 2-chlorophenol was only observed in the initial months of operation at levels below the permitted level, and was not observed after two years.

The treated groundwater is sampled monthly and the analytical data is reported in the Site monthly progress report submitted to the EPA and SCDHEC. The injection and discharge limits for the re-injection wells for VOCs are listed in Table 4.

An air operating permit was issued on 24 April 1996 by SCDHEC for the air discharge from the air strippers. The permit requires the operator to maintain a file of operational activities each month, including a description of work completed in the previous reporting period and anticipated work in the upcoming period, corrective actions taken and modification of system operation and schedule. The re-injected groundwater is sampled monthly and the analytical data is used to report the air emissions in the Site monthly progress report submitted to the EPA and SCDHEC. Monthly site progress reports are available at the site. The discharge limits for air strippers are listed in Table 5.

4.3.2 Personnel

The permit for the operations of the groundwater treatment system classifies the facility in Group I-PC, requiring the operation of the system by a Grade D certified operator. As required by the permit, the groundwater treatment system operator is a Grade D certified operator and has demonstrated the ability to perform the needed operational tasks required by the system. The operator is also certified in accordance with CFR 1910.120 for hazardous waste personnel. The staff is on call 24 hours per day. 7 days a week to respond to any emergencies.

This third five-year review verified that the treatment system operator, Scott Ingles, is licensed by the State of South Carolina as a level D operator and that he is knowledgeable of the groundwater treatment system functions, operations and maintenance schedules. Mr. Ingles is also certified in accordance with CFR 1910.120 for hazardous waste personnel.

4.3.3 Site Access and Site Control

The main gate controls access by vehicles. The groundwater treatment building is locked when unoccupied. The building is provided with a security system to monitor for burglar entry and fire. A trouble alarm from any point on the security system will cause an alarm, which will activate the interlocks, shutdown the system operation, and the auto-dialer will alert an operator. The building is only unlocked and opened during routine site visits, inspections, sampling events or ongoing maintenance. All personnel entering the Site are required to report to the office and fill out the Site entry log. In addition, personnel performing work on site are required to participate in a brief safety meeting, and review the approved Site Health and Safety Plan. Any site visitors are escorted by an O&M, Inc. personnel. Monitoring wells, recovery wells, and injection wells are also locked.

Although not a part of any plan for the Site work, since 9/11, the security personnel at the Westinghouse Nuclear Fuel Rod Manufacturing Facility provide a de-facto unscheduled security watch along Bluff Road during their routine perimeter inspection. The entrance to the Westinghouse facility is across the road from the Site and their perimeter inspection of Bluff Road provides some measure of additional security along this common boundary.

4.3.4 Inspection Procedures

Inspection procedures are in place to ensure uninterrupted operation of the groundwater recovery, treatment and injection system. Inspections are required on a weekly basis, and usually conducted daily, to monitor the operation and condition of the recovery, treatment, and injection system components. Inspection checklists are provided in Appendix D of the O&M Manual. The inspections note conditions for the recovery and injection wells and the treatment system.

Groundwater Recovery and Injection Wells
Pumping and injection flow rates are monitored and recorded;
The service road and recovery and injection well piping system are inspected; and
Groundwater levels are evaluated based on semi-annual collection of groundwater elevations.

Groundwater Treatment System
Filter bags are examined each time the operator visits the treatment system;
Air stripper blowers are inspected for signs of excess noise and vibration;
Leaks or other signs of deterioration are noted and repaired;
Treatment system piping and system pressures are checked and recorded;
Pumps in the treatment buildings are be inspected with every operator visit; and
Pumps are checked for discharge pressure, signs of excess noise, vibration, seal or gasket leaks, lubrication leaks or other signs of deterioration.

General Cleaning, Housekeeping, and Storage
Housekeeping duties outlined in the O&M Manual required general yard work, road maintenance work, field maintenance, general cleaning, and janitorial duties. It also requires that housekeeping equipment and supplies should be stored in safe and permanent storage areas.

Troubleshooting

The O&M Plan provides the equipment manufacturer's literature for troubleshooting, and review. If a piece of equipment continues to malfunction and causes the remediation system to become unreliable, manufacturer's representative are available and can be contacted for a service call or to obtain a replacement.

4.3.5 Annual O&M Costs

The projected annual O&M cost for air-stripping remediation of groundwater was $306,875 in the 1990 Feasibility Study (FS). Actual annual O&M costs for the operation and maintenance of the GWRS are below the FS projection and typically average about $280,000 a year.

4.3.6 Progress Since Commissioning

The GWRS construction is complete and startup was in August 1996. The system for extraction, treatment and injection of groundwater was anticipated to operate for 16 years.

As of August 2013, the operation of the groundwater treatment system has continued within permit levels for air emissions and treated water quality for groundwater injection.

Analytical results indicate the groundwater system is functioning satisfactorily. As of November 30, 2012, approximately 928 million gallons of groundwater have been recovered, treated and re-injected since system startup. Approximately 4,043 pounds of VOCs have been effectively removed and treated within discharge limits.

The operation of the GWRS has resulted in the improvement of groundwater quality at the Site. Based on analysis summarized in the "*Review of Ground Water Recovery System Performance, SCRDI Bluff Road Site, Columbia, South Carolina,*" Report and included as Appendix F of this Five-Year Review Report, the VOC mass in the plume has decreased by approximately 94% since startup of the GWRS. Discussion of these data is also presented in **Section 6.4**.

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2008 FYR stated:

> "*Based on this Five-Year Review, the remedies selected by the ROD for the SCRDI Bluff Road Site have been put in place are functioning properly, are operated and maintained adequately, and remain protective of human health and the environment.*
>
> *The site soils have been remediated to required standards specified in the ROD and the soils Remedial Design plans and specifications.*
>
> *The groundwater remedy continues to be operated and maintained in manner protective of human health and the environment.*"

Issues and Recommendations from the Previous Five Year Review

No deficiencies were noted during the 2008 Five-Year Review.

During the 2008 Five-Year Review, one issue was determining when the remediation of the contaminated shallow groundwater would be complete. While the larger mass of the contaminated groundwater was reduced by 91 % based on the 2007 contamination levels, it remained to be determined when the specified clean-up levels would be reached for this large plume.

Based on analysis summarized in the "*Review of Ground Water Recovery System Performance, SCRDI Bluff Road Site, Columbia, South Carolina*" Report and included as Appendix F of this Five-Year Review Report, the VOC mass in the plume has decreased by approximately 94% since startup of the GWRS.

6.0 Five-Year Review Process

6.1 Administrative Components

The EPA in conjunction with SCDHEC conducted the FYR of the remedy implemented at the Site. EPA initiated the third Five-Year Review on October 30, 2013. Parties who provided input and review of the data used for the Five-Year Review included:

EPA Region 4

- Yvonne Jones, Remedial Project Manager
- Tonya Whitsett, Public Affairs Specialist
- Kevin Koporec, Toxicologist
- Kay Wischkemper, Hydrogeologist
- Christopher Cole, Attorney

SCDHEC

- Charles Williams, Project Manager
- Greg Cassidy, Project Manager

Representatives of SCRDI Bluff Road Performing Settlors

- John Stiles, Project Manager, de maximis, inc.
- Anton Plaines, Project Manager, O&M, Inc.
- James Scott Ingles, Liscensed Operator, O&M, Inc.

This Five-Year Review includes:

- Community notification,
- Document review,
- Data collection and review,
- Site Inspection,
- Local interviews, and
- FYR Report development and review.

6.2 Community Involvement

Activities to promote community involvement for the SCRDI Bluff Road Site were initiated on March 29, 2013. The EPA placed a public notice in *The State* newspaper announcing the

commencement of the third Five-Year Review process for the Site, providing contact information for Remedial Project Manager Yvonne Jones and Community Involvement Coordinator Tonya Whitsett, and inviting community participation. In addition, a postcard mailing followed on April 19, 2013 and was delivered to the homes of approximately 50 residents in the rural area. Copies of the newspaper notice and the postcard are available in Appendix B. There were no phone calls received in response to the mailing. However, one phone call was received in response to the placement of the newspaper notice. The remedial project manager assigned to the Site responded to the community member's concerns by referring to historical documents for the Site which indicate that contamination does not exist outside of the Site's identified boundaries. The property of interest to the caller was estimated to be at a distance of over four miles away from Site boundaries.

The FYR Report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated site repository located at the following locations: The EPA Records Center, 11th Floor, 61 Forsyth Street, SW, Atlanta, GA 30303; and located at the Richland County Public Library, 7421 Garners Ferry Road, Columbia, SC 20209.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the 1990 ROD, the 1991 ESD, the previous FYR, and the "*Review of Ground Water Recovery System Performance, SCRDI Bluff Road Site, Columbia, South Carolina*" Report. A complete list of the documents reviewed can be found in Appendix A.

ARAR Review

CERCLA Section 121 (d)(l) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility sitting laws that specifically address a hazardous substance, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate. To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no Applicable or Relevant and Appropriate Requirements (ARARs) exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health-or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical specific ARARs include MCLs

under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology-or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated groundwater or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed. Chemical-specific ARARs for groundwater COCs were reviewed against current National Primary and Secondary Drinking Water Regulations (40 CFR 141-143). Table 6 is the ARAR Comparison. As the remedial action and cleanup of the Site soils has been completed, the data for the Site soils did not require review at this time.

Groundwater ARARs

According to the 1990 ROD, federal primary MCLs and MCLs for drinking water in South Carolina were identified as groundwater ARARs. For COCs that did not have a federal or state primary standard, risk-based cleanup goals were established. ARARs from the 1990 ROD were compared to current Federal and South Carolina standards (Table 6). Groundwater ARARs remain the same for the following COCs; carbon tetrachloride, benzene, 1,1,1-trichloroethane, 1,1-dichloroethene, 1,2-dichloropropane, trichloroethene, ethylbenzene, 1,2-dichloroethane, chlorobenzene, tetrachloroethene, 1,2-dichloroethene, xylene, cadmium, and mercury.

The MCL for chloroform has increased from 20.0 ppb to 80 ppb. Recent monitoring well data indicates groundwater concentrations for chloroform ranged from non-detect to 150 ppb.

The MCL for 1,1,2-trichloroethane has increased from 2.2 ppb to 5 ppb. Recent monitoring well data indicates groundwater concentrations for 1,1,2-trichloroethane ranged from non-detect to .52 ppb.

The MCL for barium, chromium, copper, lead and selenium increased. However, the results of the 1995 Supplemental Groundwater Investigation indicated that all metals excluding iron and manganese did not exceed the Target Cleanup goals. According to background data, iron and manganese were naturally occurring. Therefore, metal analysis were discontinued for the Site. However, current metal analysis should be obtained to ensure the remedy is protective for the metal contaminants.

The MCL for methylene chloride has decreased from 17 ppb to 5 ppb. Recent monitoring well data indicates groundwater concentrations for methylene chloride ranged from non-detect to .20 ppb.

The MCL for toluene has decreased from 2000 ppb to 1000 ppb. Recent monitoring well data indicates groundwater concentrations for Toluene ranged from non-detect to .17 ppb.

The MCL for arsenic has decreased from 50 ppb to 10 ppb. The results of the 1995 Supplemental Groundwater Investigation indicated that all metals excluding iron and manganese did not exceed the Target Cleanup goals. According to background data collected during the 1995 Supplemental Investigation, iron and manganese were considered naturally occurring and metal analysis were discontinued for the Site. However, current metal analysis should be obtained to ensure the remedy is still protective for the metal contaminants.

There are no Federal or State primary MCLs established for acetone, 1,1-dichloroethane, 2-butanone, 1,1,2,2 – tetrachloroethane,4-methyl-2-pentanone, 2-chlorophenol, iron, manganese or zinc. However, ensuring the appropriate risk-based criteria is determined for each contaminant of concern warrants follow-up, but does not affect protectiveness.

Additional discussion regarding ARARs is provided in **Section 7.2**. A historical summary of the monitoring well data is provided in Appendix F.

Institutional Controls Review

The EPA conducted a review of institutional controls (ICs) at the Site and surrounding properties. No ICs have been implemented for the Site or the surrounding properties. Although the 1990 ROD did not require them, ICs restricting groundwater and land use are needed at the Site and may be needed on the surrounding properties to ensure that future use will remain protective of human health and the environment. Table 7 presents property information for the SCRDI Bluff Road property (R18700-04-19 and R18700-04-20A) and ICs needed. Further evaluation of the adjacent properties (R18700-04-18 and R21400-01-01) near the SCRDI Bluff Road property is required to determine if ICs are needed. Figure 5 shows the location of the SCRDI Bluff Road Property (including the Site) and the surrounding parcels in relation to the Site.

6.4 Data Review

6.4.1 Remedy Performance

Soil Remedy Evaluation

As the remedial action and cleanup of the site soils has been completed, the data for the site soils did not require review at this time. In addition, the 2003 Five-Year Review stated in **Section IX** that further Five-Year Reviews were not necessary for the soil remedial action.

Groundwater Remedy Evaluation

A review of documents and monitoring reports through August 2013 (Appendix B) indicates that total VOC concentrations have decreased at the Site. The operation of the GWRS has continued within permit levels for air emissions and treated water quality for groundwater injection.

In August 2013, de maximis, inc. and Services Environmental, Inc. on behalf of the Performing Settlors, completed an evaluation of the performance of the GWRS. The findings of this evaluation are detailed in the "*Review of Ground Water Recovery System Performance, SCRDI Bluff Road Site, Columbia, South Carolina,*" Report included as Appendix F of this Five-Year

Review Report. According to the "*Review of Ground Water Recovery System Performance, SCRDI Bluff Road Site, Columbia, South Carolina,*" Report submitted on August 21, 2013, the following are some of the conclusions that were made:

Groundwater Containment

Figure 4 presents the locations of the recovery and injection wells, monitoring wells, and a delineation of the VOC plume prior to the startup of the GWRS. The VOC plume had been divided into the northern and southern plumes. The division is based on a change in groundwater flow direction just south of recovery well RW-05. Recovery wells RW-01 to RW-05 are located along the axis of the northern plume. Recovery wells RW-06 to RW-08 are located in the southern plume along Bluff Road, at the southwest limit of the Site Access Area.

Wells RW-06, RW-07, and RW-08 were designed to be the primary wells effecting hydraulic capture. Based on the balance between pumping rates and the natural ground water flow rate, wells RW-06 and RW-07 alone can contain the entire VOC plume. Recovery well RW-08 provides additional capture of VOCs outside of the RW-06 and RW-07 capture zone. Recovery wells RW-01 to RW-05 were designed to maximize VOC mass removal in the northern plume, where the highest concentrations were, and enhance containment.

The GWRS was designed to pump approximately 80 gallons per minute (gpm) from RW-01 to RW-05 in the northern portion of the plume, and an additional 55 to 60 gpm from RW-06 to RW-08 in the southern portion of the plume. These pumping rates were based on the groundwater modeling and have been refined based on the drawdown observed during operation of the GWRS. In 2012, the average total pumping rate from the northern recovery wells was 73 gpm, and 53 gpm from the southern recovery wells. These rates are sufficient to maintain plume capture.

Figure 6 presents the capture zone for RW-06 and RW-07, interpreted by drawing streamlines at right angles to the ground water potentiometric surface contours. The capture zone presented is consistent with previous interpretations and encompasses the entire VOC plume. Wells located along the eastern and western limits of capture have no VOCs levels above the Cleanup Criteria specified in the 1990 ROD.

Table 8 presents the results of the Annual 2012 groundwater sampling for individual compounds. Table 9 presents a summary of total VOCs since the GWRS began operation. In addition, for wells sampled annually, total concentration versus time plots are presented in the the "*Review of Ground Water Recovery System Performance, SCRDI Bluff Road Site, Columbia, South Carolina,*" Report included as Appendix F of this Five-Year Review Report.

Groundwater Quality

Nineteen monitoring wells were sampled in 2012; ten of these wells had concentrations detected above Target Cleanup Criteria. With the exception of wells MW-10B, MW-12B, MW-23B and MW-24B, VOC levels in the site monitoring wells are declining or are below Target Cleanup Criteria.

- In MW-10B concentrations appear to have peaked one or two years ago and that trend is now declining. MW-12B concentrations are still slightly trending up. MW-12B is in the

middle of the Site amid groundwater extraction wells and the trend is not considered an issue of protectiveness. A similar increasing trend and subsequent decline was observed in RW-02, located generally upgradient of MW-12B. PCE concentrations at RW-02 peaked in 2009 or 2010 and have been decreasing since.

- At MW-24B, the concentrations of several VOCs have been relatively stable for the last few years. This observation suggests that there is still a VOC plume upgradient of MW-24B that is still moving through the aquifer. As has been seen at other wells, the concentrations are expected to decline once the plume has moved past these wells.

Figure 7 presents four "plumes" (2006, 2008, 2010 and 2012) in the groundwater. The data contoured are the ratio of concentration to the cleanup ratio. The area within the contour =1 exceeds cleanup criteria for one or more VOCs. The area outside of the contour =1 is below the cleanup criteria for all VOCs.

Recovery Wells

VOC levels in all of the recovery wells have been declining since 2000. The concentrations in the recovery wells are all represented by asymptotic trends. Table 8 summarizes total VOCs in the recovery wells since startup of the GWRS. Seven of the eight recovery wells were sampled in 2012; well RW-03 was not sampled. Recovery well RW-03 has not been in operation since 1997 and is no longer sampled. Groundwater from RW-03 contained high iron levels that interfered with effective operation of the groundwater treatment system.

Overall Remedial Performance

The GWRS has been in operation since September 1996 and has contained the entire VOC plume since startup. Operation of the GWRS has significantly decreased the mass of VOCs in the Site groundwater. As November 2012, approximately 928 million gallons of groundwater have been removed and approximately 4,043 lbs of VOCs have been recovered and treated. Approximately 54 lbs of VOCs were recovered in 2012.

Figures 7 and 8 summarize the remedial progress. Figure 7, described previously, shows that the ground water plume is shrinking. Figure 8 presents the annual average total VOC concentrations for the monitoring wells and for the recovery wells for each year since the system began operation. The average concentration is approximately proportional to the VOC plume mass. Both the monitoring well and recovery well data show a steady and similar rate of decline in concentrations. Based on this analysis, the VOC mass in the plume has decreased by approximately 94% since startup of the GWRS.

6.4.2 Vapor Intrusion Pathway Evaluation

Although VOCs were detected in groundwater at several on-site wells, vapor intrusion (VI) was not addressed as a potential pathway during previous investigations. The groundwater is not used as a potable supply and there is no plume or indication of a plume beneath any inhabitable structures. Therefore, no further VI evaluations are required unless the future land use changes.

6.5 Site Inspection

The site inspection for this FYR was conducted on October 30, 2012, by Yvonne Jones, the EPA Region 4; Charles Williams and Greg Cassidy, SCDHEC; John Stiles, de maximis, inc.; and Scott Ingles and Anton Plaines, O&M, Inc. John Stiles is the Project Manager for the Site. Mr. Ingles is the SCDHEC licensed site operator (level D), an O&M, Inc. employee, and is responsible for day to day operations and maintenance. He is knowledgeable of the groundwater treatment system functions, operations and maintenance schedules. He is also certified in accordance with CFR 1910.120 for hazardous waste personnel. Operators are on call 24 hours per day, 7 days a week to respond to any emergencies. Mr. Plaines is the site operations manager for O&M, Inc. and is very familiar with site operations and visits the Site at least twice annually for the groundwater sampling events.

The permits and O&M manuals require the operator to maintain a file of operational activities each month, including a description of work completed in the previous reporting period and anticipated work in the upcoming period. Corrective actions taken and modification of system operation and schedule are also included in the file. These records were on-site and maintained in good order. Copies of the site permits were at the site. Copies of the monthly progress reports provided to the EPA, since commencement of groundwater system operations in 1996, were in the site records.

A detailed tour of groundwater remediation system was given by representatives of de maximis, inc., and O&M, Inc. During the tour, it was also verified that the monitoring wells, recovery wells, and injection well casing are kept secure by locks at the well casings. Good site management practices are being fully implemented. The FYR site inspection checklist is included in Appendix E.

6.6 Site Interviews

The site interview for this FYR was conducted on October 30, 2012, by Yvonne Jones, the EPA Region 4; Charles Williams and Greg Cassidy, SCDHEC; John Stiles, de maximis, inc.; and Scott Ingles and Anton Plaines, O&M, Inc. Representatives of de maximis, inc. and O&M, Inc. responded to additional questions during the month of November 2012 and December 2012. In general all work has been performed without conflict and in compliance with the legal orders arranged for the RD, RA O&M and monitoring activities. Current uses of the Site, groundwater contamination and other system optimization activities were discussed. Additional discussions and correspondence with representatives of de maximis, inc., Services Environmental, Inc. and the Performing Settlors occurred throughout this review period. All parties were readily forthcoming with all pertinent documentation needed for the five-year review process.

Activities to engage the community in the FYR process were initiated with a notice placed in *The State* newspaper on Friday, March 29, 2013. The notice announced commencement of the third Five-Year Review, invited comments and provided point-of-contact information for the EPA Superfund Site Remedial Project Manager and Community Involvement Coordinator while noting the availability and location of the report once made available. A copy of the notice, as

well as a postcard from the mailing which followed the publication of the notice, is provided in Appendix B of this report.

In brief summary, the SCRDI Bluff Road Site is in a rural area in which the closest residential community is located at a distance of over 1 mile away from the Site. There is not an organized group of local citizens presently involved with this Site. Since the initial clean-up activities, community interest in the Site has been minimal.

In addition to the placement of the public notice, research was conducted to gather the addresses of residents nearest the Site. There were no calls received in response to an invitation to participate in the interview process via a postcard mailing which followed the publication of the notice.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the Site 1990 ROD. The review of documents, ARARs, risk assumptions, the ongoing groundwater recovery and treatment system and the results of the site inspection indicates that the remedy is functioning as intended by the 1990 ROD.

Construction of the soil remedy was started and completed in 1994. The soil cleanup goals were achieved in late 1996. The EPA approved the soil remedy as complete in March 1997 and the system was removed from the site by early April 1997. The approval of the completion of soil remedy was made by the EPA in March 1997.The preliminary Close Out Report issued by the EPA on September 9, 1998 indicates the same and documents the operational status of the groundwater remedy at that time.

The groundwater remedial system construction was completed in August 1996. Operation of the groundwater recovery and treatment system is ongoing. The groundwater remedial action continues to operate and function as designed. As of August 2013, the operation of the GWRS has continued within permit levels for air emissions and treated water quality for groundwater injection. Analytical results indicate the groundwater treatment system is functioning satisfactorily. Groundwater sampling of the monitoring wells indicate groundwater contamination levels are declining except for MW-12B which is in the middle of the Site amid recovery wells so the condition does not affect the protectiveness conclusion.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Yes, the exposure assumptions, toxicity data and cleanup levels used at the time of the remedy are still valid. Site-specific RAOs were not generated at the time of the remedy, but were included in the O&M plan. The RAOs used during the O&M phase are still valid.

The environmental data presented in the RI was reviewed. The standard practice at the time included the selection of "indicator chemicals." The evaluation determined that groundwater and soil were the media of concern and decided to carry all detected soil and groundwater contaminants forward for additional evaluation. Since screening was not conducted to pare down

the list of contaminants carried forward for quantitative risk evaluation, no contaminants were eliminated from consideration that would have been carried forward using current screening values.

All of the detected contaminants were carried forward for quantitative evaluation, and each has a clean-up goal presented in the 1990 ROD. The current sampling includes analyses, data presentation, and screening of a range of contaminants beyond those specified in the 1990 ROD. It appears that all potential contaminants of concern continue to be properly evaluated in site documents.

The review of groundwater ARARs in Table 6 suggests that federal and state MCLs for carbon tetrachloride, benzene, 1,1,1-trichloroethane, 1,1-dichloroethene, 1,2-dichloropropane, trichloroethene, ethylbenzene, 1,2-dichloroethane, chlorobenzene, tetrachloroethene, 1,2-dichloroethene, xylene, cadmium, and mercury remain the same. The cleanup goals proposed in the 1990 ROD for 1,1,2-trichloroethane, barium, chromium, copper, lead and selenium are lower than the current ARARs. Therefore, the cleanup goals set in the 1990 ROD remain appropriate for the protection of human health and the environment.

The cleanup goals proposed in the 1990 ROD for chloroform, 1,1,2-trichloroethane, methylene chloride, toluene and arsenic are higher than the current ARARs. However, the results of the 1995 Supplemental Groundwater Investigation indicated that all metals excluding iron and manganese did not exceed the Target Cleanup goals. According to background data, iron and manganese were naturally occurring. Furthermore, recent monitoring data indicates the maximum concentrations detected at the Site for 1,1,2-trichloroethane, methylene chloride, and toluene are below the current ARARs. However, there was one location that exceeded the current ARAR for chloroform at a concentration of 150 ppb.

According to background data collected during the 1995 Supplemental Investigation, iron and manganese were considered naturally occurring and metal analysis were discontinued for the Site. However, current metal analysis should be obtained to ensure the remedy is still protective for the metal contaminants.

Although VOCs were detected in groundwater at several on-site wells, V I was not addressed as a potential pathway during previous investigations. The groundwater is not used as a potable supply and there is no plume or indication of a plume beneath any inhabitable structures. Therefore, no further VI evaluations are required unless the future land use changes.

Physical site conditions have not changed in any way that could affect the protectiveness of the remedy.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. Present information and all groundwater sampling data indicate the groundwater remedy is still protective. There has been no other information revealed that would question the protectiveness of the groundwater remedy. Soil remediation is complete.

The Performing Settlors have an access agreement with the property owners, which prohibits installation of groundwater wells within the area of the groundwater contamination. The instituted agreement is adequate to ensure that exposure pathways do not exist for exposure to contaminated shallow groundwater aquifer. However, this agreement may expire in December 2013. Furthermore, institutional Controls outside of this agreement have not been implemented, but will be needed.

7.4 Technical Assessment Summary

The review of documents, ARARs, risk assumptions, and the results of the site inspection indicate that the remedy was functioning as intended by the 1990 ROD. The 1990 ROD did not require ICs at the Site, but ICs are needed on the SCRDI Bluff property and may be needed on the surrounding properties to restrict groundwater use. Further evaluation of the adjacent properties (R18700-04-18 and R21400-01-01) near the SCRDI Bluff Road property is required to determine if ICs are needed. The EPA should continue to work with the Performing Settlors, SCDHEC and the landowners to implement ICs. The Performing Settlors should work closely with the property owners to ensure access is maintained.

8.0 Issues

Table 10 summarizes the issues generated during this five-year review.

Table 10: Issues for the SCRDI Bluff Road Site

Issue	Affects Current Protectiveness? (Y/N)	Affects Future Protectiveness? (Y/N)
The 1990 ROD did not require ICs. ICs are necessary because there are no restrictions on the Site to prevent exposure to contaminated groundwater other than SCDHEC's well permit requirements for new installations and an access agreement that may expire in December 2013.	No	Yes
The access agreement may expire in December 2013.	No	Yes
ICs may be needed on properties adjacent to the Site.	No	Yes
Metal Analysis were discontinued in 1995	No	Yes
No Federal or South Carolina Primary MCL has been established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane, 4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese or Zinc.	No	No

9.0 Recommendations and Follow-up Actions

Table 11 provides recommendations to address the current issues at the SCRDI Bluff Road Site.

Table 11: Recommendations to Address Current Issues at the SCRDI Bluff Road Site

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
The 1990 ROD did not require ICs. ICs are necessary because there are no restrictions on the Site to prevent exposure to contaminated groundwater other than SCDHEC's well permit requirements for new installations and an access agreement that may expire in December 2013.	An appropriate decision document should be prepared to include appropriate institutional controls.	EPA and SCDHEC	EPA and SCDHEC	09/30/2015	No	Yes
The access agreement may expire in December 2013.	Performing Settlors should secure appropriate access for the duration of the remedial action.	Performing Settlors	EPA and SCDHEC	09/30/2014	No	Yes
ICs may be needed on properties adjacent to the Site.	Evaluate the need for ICs on properties adjacent to the Site.	Performing Settlors, EPA and SCDHEC	EPA and SCDHEC	09/30/2014	No	Yes
Metal Analysis were discontinued in 1995.	Current metal analysis should be obtained to ensure the remedy is still protective for the metal contaminants.	Performing Settlors	EPA and SCDHEC	12/30/2014	No	Yes
No Federal or South Carolina Primary MCL has been established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane, 4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese or Zinc.	Evaluate the level of protectiveness and determine whether the 1990 ROD cleanup goals established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane, 4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese and Zinc remain within the acceptable risk range.	Performing Settlors	EPA and SCDHEC	03/30/2014	No	No

10.0 Protectiveness Statement

The remedies selected for the SCRDI Bluff Road Site are protective in the short term since there is no complete exposure pathway to contaminated groundwater and the GWRS is functioning as intended by the 1990 ROD.

For the remedy to be protective in the long term, the following actions should occur:

- An appropriate decision document should be prepared to include appropriate institutional controls.

- Performing Settlors should secure appropriate access from property owners for the duration of the remedial action.
- Evaluate the need for ICs on properties adjacent to the Site.
- Current metal analysis should be obtained to ensure the remedy is still protective for the metal contaminants.
- Evaluate the level of protectiveness and determine whether the 1990 ROD cleanup goals established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane, 4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese and Zinc remain within the acceptable risk range.

11.0 Next Review

The next five-year review for the SCRDI Bluff Road Site is required five years from the completion date of this review.

APPENDIX A

DOCUMENTS REVIEWED

Appendix A
Documents Reviewed
SCRDI Bluff Road Superfund Site
Third Five-Year Review

Remedial Investigation Bluff Road Site, April 1986, Richland County South Carolina, Volumes I and II of II, Golder Associates.

Remedial Investigation Report SCRDI-Bluff Road Site, February 1990, Volume I and II, IT Corporation, Knoxville, TN.

Feasibility Study Report SCRDI-Bluff Road Site, Volume I and II- Report, March 1990, Columbia, South Carolina.

Record of Decision, Remedial Alternative Selection, SCRDI Bluff Road Site, September 1990, SCRDI Bluff Road Superfund Site.

Superfund Program Explanation of Significant Differences, March 1991, SCRDI Bluff Road Superfund Site Columbia, Richland County, South Carolina, Fact Sheet describing the change in the five-year review provisions applicable to the SCRDI Bluff Road Superfund Site.

Superfund Program Explanation of Significant Differences, Fact Sheet, June 1994

Supplemental Ground Water Sampling Investigation Report, April 1995, Environmental Resources Management, Inc.

Operations and Maintenance Plan Documents, June 1996, Volume I, Construction Submittal, Operations and Maintenance Manual and Support Documents, Ground Water Recovery, Treatment and Injection System, Environmental Resources Management, Inc.

Operations and Maintenance Plan Documents, June 1996, Volume II, Construction Submittal, Operations and Maintenance Manual and Support Documents, Ground Water Recovery, Treatment and Injection System, Environmental Resources Management, Inc.

Ground Water Recovery Treatment, and Injection Systems Operations and Maintenance Plan, SCRDI-Bluff Road Site, June 1996, Construction Submittal, Environmental Resources Management, Inc.

Ground Water Recovery Treatment, and Injection Systems Performance Standards Verification Plan, Appendix C, June 1996, Final Submittal, Environmental Resources Management, Inc.

SCRDI Bluff Road Site VVE Remedial System Soil Closeout Report, August 1996, Prepared by Terra Vac.

Baseline Groundwater Sampling Event for the SCRDI-Bluff Road Site, Julyl996, Environmental Resources Management, Inc.

Capture Zone Evaluation, SCRDI-Bluff Road Site, November 1997, Environmental Resources Management, Inc.

Southwest Area Investigation Report, SCRDI-Bluff Road Site, January 1998, Environmental Resources Management, Inc.

First Five-Year Review Report, April 2003, US EPA, Region 4.

Second Five-Year Review Report, September 2008, US EPA, Region 4.

SC DHEC Regulation 61-58 State Primary Drinking Water Regulation- August 2009

SC DHEC Regulation 61-68 Water Classifications and Standards - June 2012

Review of Groundwater Recovery System Performance, Services Environmental, Inc., August 21, 2013.

Monthly Progress Reports, August 2008 – August 2013, de maximis, inc.

Summary of Sampling Groundwater and Recovery Wells, SCRDI, Bluff Road, Columbia, South Carolina, August 2013.

SCDHEC air and groundwater injection permits (copies available in site records at the treatment building)

APPENDIX B

COMMUNITY RELATIONS

THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
Announces the
Third Five-Year Review
For the SCRDI Bluff Road Superfund Site

The U.S. Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) are conducting the Third Five-Year Review of the SCRDI Bluff Road Superfund Site located in Columbia, Richland County, South Carolina. The purpose of this review is to evaluate the implementation and performance of the remedy in order to determine if the remedy continues to be protective of human health and the environment.

The first Five-Year Review for the site, issued in 2003, determined that cleanup actions taken continue to be protective of human health and the environment. The second Five-Year Review was completed in 2008 and found that the cleanup approach remains protective.

As a component of the Five-Year Review, EPA conducts interviews with nearby businesses, residents, local officials, state officials, and others to obtain their opinions on the cleanup process. The community can contribute during this Five-Year Review by providing comments or questions. Community members who have questions about the site or the Five-Year Review process, or who would like to participate in a community interview, are asked to contact a site team representative.

Community Engagement: Tonya Whitsett, EPA Community Involvement Coordinator at (404) 562-8633.
Technical Inquiries: Yvonne Jones, EPA Remedial Project Manager at (404) 562-8793.

Upon completion, a copy of the Five-Year Review report will be placed in the Information Repository files located in the EPA Record Center, 11th Floor, 61 Forsyth Street, SW, Atlanta, GA 30303, and at the Richland County Public Library, 7421 Garners Ferry Road, Columbia, SC 29209. Additional site information is available at the local document repository and online at:
http://www.epa.gov/region4/superfund/sites/npl/southcarolina/scrdibfrsc.html

THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
Announces the
Third Five-Year Review
for the
SCRDI Bluff Road Superfund Site

On March 29, 2013, a notice announcing the Third Five-Year Review for the SCRDI Bluff Road Superfund Site ran in *The State* newspaper. The purpose of this review is to evaluate the implementation and performance of the remedy in order to determine if the remedy continues to be protective of human health and the environment. As a component of the Five-Year Review, EPA conducts interviews with various members of the community to obtain opinions on the cleanup process. Community members who have questions about the site or the Five-Year Review process, or who would like to participate in community interviews conducted through April 2013, are asked to contact a site team representative.

- Technical Inquiries: Yvonne Jones
  EPA Remedial Project Manager at (404) 562-8793.
- Community Engagement: Tonya Whitsett
  EPA Community Involvement Coordinator at (404) 562-8633.

EPA plans to complete the Five-Year Review by August 2013. Upon completion, a copy of the Five-Year Review report will be placed in the Information Repository located in the EPA Record Center, 11th Floor, 61 Forsyth Street, SW, Atlanta, GA 30303, and at the Richland County Public Library, 7421 Garners Ferry Road, Columbia, SC 29209.

APPENDIX C

TABLES

Table 1: Site Chronology

Key Milestones	Dates
SCRDI drum storage site closed upon discovery by SCDHEC of site soils and ground water contamination	1980
Surficial clean-up of all site drums and surface materials completed	1982 - 1983
Site proposed to be listed on the National Priorities List (NPL)	December 1992
Site listed on the NPL	September 1983
Start of initial Remedial Investigation/Feasibility Study (RI/FS) by SCDHEC	July 1984
Completion of initial RI/FS by SCDHEC	September 1987
Administrative Order on Consent issued to the Potentially Responsible Parties (PRPs)	February 1988
Pilot tests confirm Soil Vapor Extraction (SVE) system will remediate contaminated site soils	July 1990
RI/FS completed by some of the PRPs	September 1990
EPA issues Record of Decision (ROD)	September 1990
Explanation of Significant Differences (ESD) issued by the EPA	March 1992
Removal Assessment	August 1992
The EPA enters into Consent Decree with the remaining PRPs to complete soils and groundwater remediation	September 1992
Remedial Design Work Plan is completed to proceed with design of the groundwater recovery system	1993
Submittal of SVE system design for soils remediation	September 1993
The EPA conducts public meeting	May 1994
The EPA and SCDHEC approve the SVE System design and issue the second ESD	June 1994
SVE operations begin	October 1994
EPA enters into a Consent Decree with the PRPs who conducted the earlier RI/FS	June 1995
Remedial Design (RD) is approved for the groundwater remediation system	December 1995
SVE yearly operations report submitted to the EPA and SCDHEC	December 1995
SVE pulse operations begin	December 1995
SVE pulse test report submitted to the EPA and SCDHEC	February 1996
Preliminary soil borings report submitted to the EPA and SCDHEC	April 1996
Public meeting at Hopkins Community Center with the EPA and SCDHEC to discuss site work and groundwater remedy	May 1996
Confirmatory soil borings completed	June 1996
Construction of the Groundwater Recovery System (GWRS) completed and operations begin for contaminated groundwater recovery.	August 1996
SVE Remedial System Soil Closeout Report for soils remediation submitted	August 1996
The EPA and SCDHEC approve SVE Closeout Report and agree the soil remedy actions are completed. Decommissioning plan for SVE system approved.	February 1997
Completed SVE decommissioning activities	March 1997
Submittal of SVE decommissioning report to the EPA and SCDHEC	April 1997
Capture Zone Evaluation Report submitted for GWRS	November 1997
Southwest Area Investigation Report submitted for groundwater remedy	January 1998
The EPA issues Preliminary Close Out Report	September 1998
The EPA approves the first Five-Year Review Report, which was prepared by the United States Army Corps of Engineers (USACE)	April 2003
Second Five-Year Review was completed	September 2008

Table 2: Soil Cleanup Goals

Parameter	Target Cleanup Level Specified in the 1990 ROD (ppm)
1, 1-Dichloroethane	0.006
1,1,1-Trichloroethane	1.03
1,1,2,2-Tetrachoroethane	0.001
1,1,2-Trichloroethane	0.001
1,1-Dichoroethene	0.013
1,2-Dichloroethene	0.12
1,2-Dichoroethane	0.005
2-Butanone	0.055[a]
2-Chorophenol	0.55
4-Methyl-2-Pentanone	0.55[a]
Acetone	1.1
Benzene	0.012
Carbon Tetrachloride	0.053[a]
Chlorobenzene	0.956
Chloroform	0.021
Ethylbenzene	0.223
Methylene Chloride	0.017[a]
Phenol	3.95
Tetrachloroethene	0.053
Toluene	0.174
Total Xylenes	0.695
Trichloroethene	0.018
Vinyl Chloride	0.003

[a] Ground Water Target Cleanup Level.

Table 3: Groundwater Cleanup Goals

COC Volatile Organic Compounds	Cleanup Goal Specified in the 1990 ROD (µg/L)
1,1,1-Trichloroethane	200[a]
1,1,2,2 Tetrachloroethane	0.6[c]
1,1,2-Trichloroethane	2.2[c]
1,1-Dichloroethane	5[a]
1,1-Dichloroethene	7[a]
1,2-Dichloroethane	5[a]
1,2-Dichloroethene	70[a]
1,2-Dichloropropane	5[a]
2-Butanone	550[d]
2-Chlorophenol	55[d]
4-Methyl-2-Pentanone	550[d]
Acetone	1100[d]
Benzene	5[a]
Carbon Tetrachloride	5[a]
Chlorobenzene	100[a]
Chloroform	20.9[c]
Ethylbenzene	700[a]
Methylene Chloride	17[c]
Tetrachloroethene	5[a]
Toluene	2000[a]
Total Xylenes	10,000[a]
Trichloroethene	5[a]

[a]SWDA, MCLs, proposed MCLs, non-zero MCLGs.
[c]Derived from CPF and exposure model.
[d]Derived from RFD and exposure model.

Table 3: Groundwater COC Cleanup Goals (continue)

Contaminants of Concern Metals	Cleanup Goal Specified in the 1990 ROD (µg/L)
Arsenic	50 [a]
Barium	1000 [a]
Cadmium	5 [a]
Chromium	50 [a]
Copper	1000 [e]
Iron	300 [e]
Lead	5 [a]
Manganese	50 [e]
Mercury	2 [a]
Selenium	10 [a]
Zinc	5000 [e]

[a]SWDA, MCLs, proposed MCLs, non-zero MCLGs.
[c]Derived from CPF and exposure model.
[d]Derived from RFD and exposure model.
[e]South Carolina MCL's for Class GB groundwater.

Table 4: Treated Water Injection and Discharge Limits

VOC Compounds	[1] Injection Well Discharge Limit (µg/L)
1,2-Dichloropropane	5
1,1,1-Trichloroethane	200
1,1,2,2-Tetrachloroethane	0.6
1,1,2-Trichoroethane	2
1,1-Dichloroethane	5
1,1-Dichloroethene	7
1,2-Dichloroethane	5
1,2-Dichloroethene	70
2-Butanone	550
4-Methyl-2-Propane	550
Acetone	1100
Benzene	5
Carbon Tetrachloride	5
Chlorobenzene	100
Chloroform	21
Ethylbenzene	700
Methylene Chloride	17
Tetrachloroethane	5
Toluene	2000
Total Xylenes	10000
Trichloroethane	5

[1] The injection and discharge limits required by the Injection Operating Permit #149 for the re-injection wells for VOCs.

Table 5: Air Discharge Limits

Parameter	[1] Discharge Limit (lb/hour)	[1] Discharge Limit (tons/year)
1,1,2,2-Tetrachloroethane	0.083	0.364
1,1,2-Tetrachloroethane	0.055	0.241
Benzene	0.03	0.131
Carbon Disulfide	8.33 E-05	3.65E-04
Carbon Tetrachloride	0.03	0.131
Chlorobenzene	0.021	0.092
Chloroform	0.261	1.143
Ethylbenzene	0.042	0.183
Ethylene Dichloride	0.053	0.232
Ethylidine Dichloride	0.125	0.548
Hydrochloric Acid	1	4.38
Methyl Ethyl Ketone	0.083	0.364
Methyl Isobutyl Ketone	0.042	0.184
Methylene Chloride	0.083	0.364
Phenol	0.016	0.07
Tetrachloroethane	0.083	0.364
Toluene	0.114	0.499
Trichloroethene	0.042	0.183
Vinyl Chloride	0.038	0.166
Vinylidine Chloride	0.057	0.25
Xylene	0.042	0.184

[1] The discharge limits required by the Air Permit.

Table 6: ARAR Review for Groundwater Contaminants of Concern

Parameters Volatile Organic Compounds	1990 ROD Cleanup Goals (µg/L)	Current ARARs (µg/L)	ARARs Change
1,1,1-Trichloroethane	200[a]	200	None
1,1,2,2 Tetrachloroethane	0.6[c]	NA*	NA*
1,1,2-Trichloroethane	2.2[c]	5	Less stringent
1,1-Dichloroethane	5[a]	NA*	NA*
1,1-Dichloroethene	7[a]	7	None
1,2-Dichloroethane	5[a]	5	None
1,2-Dichloroethene	70[a]	70	None
1,2-Dichloropropane	5[a]	5	None
2-Butanone	550[d]	NA*	NA*
2-Chlorophenol	55[d]	NA*	NA*
4-Methyl-2-Pentanone	550[d]	NA*	NA*
Acetone	1,100[d]	NA*	NA*
Benzene	5[a]	5	None
Carbon Tetrachloride	5[a]	5	None
Chlorobenzene	100[a]	100	None
Chloroform	20.9[c]	80	Less stringent
Ethylbenzene	700[a]	700	None
Methylene Chloride	17[c]	5	More stringent
Tetrachloroethene	5[a]	5	None
Toluene	2,000[a]	1,000	More stringent
Total Xylenes	10,000[a]	10,000	None
Trichloroethene	5[a]	5	None

[a]SWDA, MCLs, proposed MCLs, non-zero MCLGs.
[c]Derived from CPF and exposure model.
[d]Derived from RFD and exposure model.
[e]South Carolina MCL's for Class GB groundwater.
NA* - No Federal or South Carolina Primary MCL has been established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane,4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese or Zinc.

Table 6: ARAR Review for Groundwater Contaminants of Concern (continue)

Parameters Metals	1990 ROD Cleanup Goals (ug/L)	Current Cleanup Goals (ug/L)	ARARs Change
Arsenic	50[e]	10	More stringent
Barium	1,000[e]	2,000	Less stringent
Cadmium	5[e]	5	None
Chromium	50[e]	100	Less stringent
Copper	1,000	1,300	Less stringent
Iron	300[e]	NA*	NA*
Lead	5[e]	15	Less stringent
Manganese	50[e]	NA*	NA*
Mercury	2[e]	2	None
Selenium	10[e]	50	Less stringent
Zinc	5,000[e]	NA*	NA*

[a]SWDA, MCLs, proposed MCLs, non-zero MCLGs.
[c]Derived from CPF and exposure model.
[d]Derived from RFD and exposure model.
[e]South Carolina MCL's for Class GB groundwater.
NA* - No Federal or South Carolina Primary MCL has been established for Acetone, 1,1-Dichloroethane, 2-Butanone, 1,1,2,2 – Tetrachloroethane,4-Methyl-2-Pentanone, 2-Chlorophenol, Iron, Manganese or Zinc.

Table 7: Institutional Controls Summary Table

Area of Interest – Groundwater/Soil SCRDI Bluff Road Property				
ICs Needed	**ICs called for in the Decision Documents**	**Impacted Parcel**	**IC Objective**	**Instrument in Place**
Yes	No	R18700-04-19	Restrict groundwater use, land use and the installation of wells	None
Yes	No	R18700-04-20A	Restrict groundwater use, land use and the installation of wells	None
Area of Interest – Groundwater Adjacent Properties				
ICs Needed	**ICs called for in the Decision Documents**	**Impacted Parcel**	**IC Objective**	**Instrument in Place**
Evaluation is needed to determine if ICs are required	No	R18700-04-18	Restrict groundwater use and the installation of wells	None
Evaluation is needed to determine if ICs are required	No	R21400-01-01	Restrict groundwater use and the installation of wells	None

Table 8: Page 1 of 4

Filename: T-3_2012
Date Printed: 1/7/2013

Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Compound	Criteria (ug/L)	MW-02A (ug/L)		MW-03B (ug/L)		MW-08B (ug/L)		MW-09B (ug/L)		MW-10B (ug/L)		MW-11B (ug/L)		MW-12B (ug/L)		MW-13B (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Benzene	5	2.7		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Carbon Tetrachloride	5	BQL		BQL		BQL		BQL		0.14	J	BQL		0.33	J	2.7	
Chlorobenzene	100	BQL		BQL		BQL		BQL		0.3	J	BQL		BQL		BQL	
Chloroform	20.9	BQL		0.25	J	0.52		BQL		1.5		BQL		0.93		21	
1,1 Dichloroethane	5	5.1		BQL		0.11	J	BQL		17		BQL		3.4		9.6	
1,2 Dichloroethane	5	6.2		BQL		BQL		BQL		3.8		BQL		BQL		1.3	
1,1 Dichloroethene	7	26		BQL		BQL		BQL		29		BQL		2.4		8.4	
1,2 Dichloroethene	70	44		BQL		0.18	J	BQL		100		BQL		68		16	
1,2 Dichloropropane	5	BQL		BQL		BQL		BQL		0.14	J	BQL		BQL		0.12	J
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Methylene Chloride	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	BQL		BQL		0.33	J	BQL		1.1		BQL		0.58		1.5	
Tetrachloroethene	5	BQL		BQL		BQL		BQL		7.8		BQL		25		2.8	
Toluene	1000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,1 Trichloroethane	200	BQL		BQL		BQL		BQL		0.5		BQL		0.68		0.16	J
1,1,2 Trichloroethane	2.2	0.2	J	BQL		BQL		BQL		0.32	J	BQL		BQL		0.52	
Trichloroethene	5	0.56		BQL		BQL		BQL		3.8		BQL		6.7		3.4	
Xylene (total)	10000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
2-Butanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
TOTAL VOCs*		**85**		**0.25**		**1.1**		**0**		**165**		**0**		**108**		**68**	

Notes

BQL = Below Quantitation Limit
BDL = Below Detection Limit
NS = Not Sampled
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B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination.
J = This flag indicates an estimated value.
D = This flag indicates compounds identified at a secondary dilution factor
XXX = Indicates monitoring well concentration exceedance of the cleanup criteria.

Table 8: Page 2 of 4
Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-3_2012
Date Printed: 1/7/2013

Compound	Criteria (ug/L)	MW-15B (ug/L)		MW-16B (ug/L)		MW-17B (ug/L)		MW-18B (ug/L)		MW-19B (ug/L)		MW-20B (ug/L)		MW-21B (ug/L)		MW-22B (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Benzene	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Carbon Tetrachloride	5	0.83		1.6		BQL		BQL		BQL		BQL		BQL		0.97	
Chlorobenzene	100	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Chloroform	20.9	6		8.8		0.24	J	BQL		BQL		BQL		BQL		5	
1,1 Dichloroethane	5	1.8		2.1		BQL		BQL		BQL		BQL		BQL		15	
1,2 Dichloroethane	5	0.35	J	BQL		BQL		BQL		BQL		BQL		BQL		2.7	
1,1 Dichloroethene	7	2.2		2.3		BQL		BQL		BQL		BQL		BQL		18	
1,2 Dichloroethene	70	2.9		2.4		BQL		BQL		BQL		BQL		BQL		59	
1,2 Dichloropropane	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		0.17	J
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Methylene Chloride	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	1		1		BQL		BQL		BQL		BQL		BQL		1.3	
Tetrachloroethene	5	1.3		1.3		BQL		BQL		BQL		BQL		BQL		5.1	
Toluene	1000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,1 Trichloroethane	200	BQL		BQL		BQL		BQL		BQL		BQL		BQL		0.29	J
1,1,2 Trichloroethane	2.2	0.24	J	BQL		BQL		BQL		BQL		BQL		BQL		0.2	J
Trichloroethene	5	1.1		1.5		BQL		BQL		BQL		BQL		BQL		4.3	
Xylene (total)	10000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
2-Butanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
TOTAL VOCs*		**18**		**21**		**0**		**0**		**0**		**0**		**0**		**112**	

Notes

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Table 8: Page 3 of 4
Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-3_2012
Date Printed: 1/7/2013

Compound	Criteria (ug/L)	MW-23B (ug/L)		MW-24B (ug/L)		MW-25B (ug/L)		RW-01 (ug/L)		RW-02 (ug/L)		RW-03 (ug/L)	RW-04 (ug/L)		RW-05 (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
Benzene	5	BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
Carbon Tetrachloride	5	BQL		18		1		BQL		0.3	J	NS	4.1		2.1	
Chlorobenzene	100	BQL		BQL		BQL		BQL		2.1		NS	BQL		BQL	
Chloroform	20.9	0.58		150		5.4		BQL		1.6		NS	39		19	
1,1 Dichloroethane	5	9.5		3.5		0.25	J	BQL		31		NS	19		9.9	
1,2 Dichloroethane	5	1.6		1.6		BQL		BQL		0.27	J	NS	1.1		1	
1,1 Dichloroethene	7	6.1		17		1		BQL		6.1		NS	18		9	
1,2 Dichloroethene	70	10.3		5.2		0.32	J	BQL		33		NS	29		17	
1,2 Dichloropropane	5	0.11	J	0.39	J	BQL		BQL		BQL		NS	0.22	J	0.14	J
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
Methylene Chloride	5	BQL		0.2	J	BQL		BQL		BQL		NS	BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	0.63		13		0.42	J	BQL		0.5		NS	2.6		1.7	
Tetrachloroethene	5	2.7		17		0.83		0.21	J	1.6		NS	5.1		3.3	
Toluene	1000	BQL		BQL		BQL		BQL		0.17	J	NS	BQL		BQL	
1,1,1 Trichloroethane	200	BQL		1		BQL		BQL		3.5		NS	0.24	J	0.17	J
1,1,2 Trichloroethane	2.2	BQL		0.37	J	BQL		BQL		0.28	J	NS	0.19	J	0.34	J
Trichloroethene	5	2.1		21		0.88		BQL		1.3		NS	6.5		4.9	
Xylene (total)	10000	BQL		BQL		BQL		BQL		0.53		NS	BQL		BQL	
2-Butanone		BQL		BQL		BQL		BQL		3.4	J	NS	3.1	J	2.4	J
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
TOTAL VOCs*		**34**		**248**		**10**		**0.21**		**86**		**NS**	**128**		**71**	

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Table 8: Page 4 of 4
Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Compound	Criteria (ug/L)	RW-06 (ug/L)		RW-07 (ug/L)		RW-08 (ug/L)		TP-03 (ug/L)		TP-04 (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL	
Benzene	5	BQL		BQL		BQL		BQL		BQL	
Carbon Tetrachloride	5	7.1		3		6.7		BQL		3.4	
Chlorobenzene	100	BQL		BQL		BQL		BQL		BQL	
Chloroform	20.9	47		11		13		BQL		18	
1,1 Dichloroethane	5	20		0.42	J	0.25	J	BQL		0.64	
1,2 Dichloroethane	5	2.9		0.27	J	0.37	J	BQL		0.34	J
1,1 Dichloroethene	7	25		2.3		2.8		BQL		2.9	
1,2 Dichloroethene	70	53		0.59		0.4	J	BQL		0.78	
1,2 Dichloropropane	5	0.29	J	BQL		BQL		BQL		BQL	
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL	
Methylene Chloride	5	0.20	J	BQL		BQL		BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	3.7		0.9		1.9		BQL		1.1	
Tetrachloroethene	5	10		1.9		2.7		BQL		2.3	
Toluene	1000	BQL		BQL		BQL		BQL		BQL	
1,1,1 Trichloroethane	200	0.56		0.1	J	BQL		BQL		0.16	J
1,1,2 Trichloroethane	2.2	0.38	J	BQL		BQL		BQL		BQL	
Trichloroethene	5	11		1.9		2.5		BQL		2.7	
Xylene (total)	10000	BQL		BQL		BQL		BQL		BQL	
2-Butanone		6	J	BQL		BQL		BQL		BQL	
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL	
TOTAL VOCs*		**187**		**22**		**31**		**0**		**32**	

Notes

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Table 9: Page 1 of 3
Historical Total Volatile Organic Compounds*
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-4_2012
Date Printed: 1/7/2013

Monitoring Well	Baseline Event Jun 96	1st Quarter Oct 96	2nd Quarter Jan 97	3rd Quarter Apr 97	Annual Event Aug 97	Semi Annual Event Mar 98	Annual Event Aug 98	Semi Annual Event Apr 99	Annual Event Sep 99	Semi Annual Event Apr 00	Annual Event Sep 00	Semi Annual Event Apr 01
MW-02A	6340	-	-	-	2262	-	2008	-	566	-	461	-
MW-03B	BQL	-	-	-	BQL	-	2	-	BQL	-	0.6	-
MW-08B	1	BQL	BQL	BQL	BQL	BQL	2	2	1	1	5	2
MW-09B	BQL	-	-	-	BQL	-	3	-	BQL	-	0.2	-
MW-10B	95	69	93	64	168	97	115	70	82	112	137	242
MW-11B	BQL	8	BQL	BQL	BQL	BQL	4	1	BQL	BQL	5	BQL
MW-12B	38	32	31	33	57	31	30	65	66	35	44	82
MW-13B	3040	-	-	-	1087	-	1112	-	669	-	610	-
MW-15B	943	-	-	-	748	-	1143	-	770	-	233	-
MW-16B	228	-	-	-	1002	-	625	-	310	-	162	-
MW-17B	39	-	-	-	1	-	6	-	4	-	4	-
MW-18B	48	-	-	-	10	-	5	-	0.3	-	0.2	-
MW-19B	BQL	BQL	BQL	BQL	BQL	BQL	5	1	BQL	0.2	0.1	0.1
MW-20B	BQL	BQL	BQL	BQL	BQL	BQL	2	1	BQL	5	0.2	5
MW-21B	31	10	24	9	5	19	18	14	13	16	12	7
MW-22B	26	19	137	688	823	1170	1179	1269	986	813	512	569
MW-23B	2887	-	-	-	1440	-	182	-	138	-	534	-
MW-24B	1	-	-	-	BQL	-	6	-	45	-	48	-
MW-25B	3703	-	-	-	2430	-	2018	-	784	-	333	-
MW-03C	-	-	-	-	BQL	-	-	-	-	-	-	-
MW-04C	-	-	-	-	BQL	-	-	-	-	-	-	-
MW-09C	-	-	-	-	BQL	-	-	-	-	-	-	-

Southwest Area					SWAI Oct 97	SWAI Mar 98	SWAI Aug 98	SWAI Apr 99	SWAI Sep 99	SWAI Apr 00	SWAI Sep 00	SWAI Apr 01
TP-01	-	-	-	-	BQL	-	-	-	-	-	-	-
TP-02	-	-	-	-	1.7	-	-	-	-	-	-	-
TP-03	-	-	-	-	2.2	BQL	2	BQL	5	BQL	0.2	0.6
TP-04	-	-	-	-	1967	2052	1576	3493	3111	1603	1778	658

Recovery Well	Before Start-up 8/8/1996	After Start-up 8/26/1996	Semi Annual Event 1/1/1997	Annual Event Aug 97	Semi Annual Event Mar 98	Annual Event Aug 98	Semi Annual Event Apr 99	Annual Event Sep 99	Semi Annual Event Apr 00	Annual Event Sep 00	Semi Annual Event Apr 01
RW-01	BQL	1	93	BQL	BQL	10	2	1	1	1	1
RW-02	38	288	623	194	404	603	-	605	542	390	256
RW-03	2449	-	-	-	-	-	-	-	-	-	-
RW-04	955	1562	1501	1145	1047	1136	1388	1066	832	735	569
RW-05	2920	3753	2283	1611	2062	2121	1897	1373	1191	954	608
RW-06	198	547	1236	1798	1995	1924	2800	3053	1899	1941	1259
RW-07	1460	3321	1596	1678	1604	1491	1222	886	709	556	478
RW-08	728	935	484	1006	1238	566	778	556	640	460	366

Notes :

All results reported as ug/L
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* - Total VOCs is the sum of all values, including B- and J-qualified results.

Table 9: Page 2 of 3
Historical Total Volatile Organic Compounds*
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-4_2012
Date Printed: 1/7/2013

Monitoring Well	Annual Event Sep 01	Semi Annual Event May 02	Annual Event Oct 02	Semi Annual Event Apr 03	Annual Event Oct 03	Semi Annual Event Apr 04	Annual Event Oct 04	Semi Annual Event Apr 05	Annual Event Oct 05	Semi Annual Event Apr 06	Annual Event Sep 06	Semi Annual Event Apr 07
MW-02A	469	-	447	-	932	-	135	-	495	-	120	-
MW-03B	1.1	-	1.1	-	0.9	-	0.5	-	0.5	-	0.7	-
MW-08B	4	1	2	1	3	14	1	0.2	0.2	2.4	1.7	BQL
MW-09B	0.2	-	0.1	-	0.8	-	BQL	-	BQL	-	0.3	-
MW-10B	452	476	454	583	603	280	255	251	223	360	237	198
MW-11B	0.2	0.2	0.1	BQL	BQL	20	0.2	BQL	BQL	0.4	0.5	BQL
MW-12B	89	120	109	90	103	102	96	139	103	178	118	115
MW-13B	202	-	89	-	73	-	72	-	56	-	46	-
MW-15B	85	-	75	-	56	-	32	-	37	-	33	-
MW-16B	337	-	172	-	130	-	47	-	168	-	125	-
MW-17B	2.8	-	3.3	-	4	-	1	-	0.6	-	0.7	-
MW-18B	1	-	0.4	-	0.4	-	0.1	-	BQL	-	0.3	-
MW-19B	0.1	0.6	0.1	0.1	BQL	12	BQL	0.1	BQL	1.1	0.5	1
MW-20B	0.4	0.3	0.1	0.5	BQL	13	0.2	BQL	BQL	2	0.5	BQL
MW-21B	4.1	2	1.5	1.8	2	12.0	1.1	0.3	BQL	0.6	0.9	BQL
MW-22B	428	439	372	423	495	566	470	417	374	604	267	282
MW-23B	95	-	70	-	75	-	57	-	84	-	84	-
MW-24B	398	-	669	-	402	-	348	-	292	-	305	-
MW-25B	96	-	96	-	70	-	33	-	32	-	39	-
MW-03C	-	-	-	-	-	-	-	-	-	-	-	-
MW-04C	-	-	-	-	-	-	-	-	-	-	-	-
MW-09C	-	-	-	-	-	-	-	-	-	-	-	-

Southwest Area	SWAI Sep 01	SWAI May 02	SWAI Oct 02	SWAI Apr 03	SWAI Oct 03	SWAI Apr 04	SWAI Oct 04	SWAI Apr 05	SWAI Oct 05	SWAI Apr 06	SWAI Sep 06	SWAI Apr 07
TP-01	-	-	-	-	-	-	-	-	-	-	-	-
TP-02	-	-	-	-	-	-	-	-	-	-	-	-
TP-03	0.2	0.4	0.3	0.2	BQL	19	BQL	0.2	BQL	2.2	0.4	1.4
TP-04	520	355	399	270	168	106	143	131	126	77	119	58

Recovery Well	Annual Event Sep 01	Semi Annual Event May 02	Annual Event Oct 02	Semi Annual Event Apr 03	Annual Event Oct 03	Semi Annual Event Apr 04	Annual Event Oct 04	Semi Annual Event Apr 05	Annual Event Oct 05	Semi Annual Event Apr 06	Annual Event Oct 06	Semi Annual Event Apr 07
RW-01	BQL	2	0.3	0.1	BQL	9	0.4	BQL	-	7	2	-
RW-02	280	161	197	224	331	190	114	96	138	129	151	137
RW-03	-	-	-	-	-	-	-	-	-	-	-	-
RW-04	521	362	386	379	306	231	188	215	182	236	217	155
RW-05	580	367	304	356	236	178	125	182	167	168	157	112
RW-06	1012	852	869	667	741	635	465	448	472	643	507	395
RW-07	294	264	245	192	170	142	93	124	91	130	115	62
RW-08	385	231	239	223	157	126	75	71	74	104	87	52

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Table 9: Page 3 of 3
Historical Total Volatile Organic Compounds*
SCRDI - Bluff Road Site
Columbia, South Carolina

Monitoring Well	Annual Event Oct 07	Semi Annual Event Apr 08	Annual Event Oct 08	Semi Annual Event May 09	Annual Event Dec 09	Semi Annual Event May 10	Annual Event Nov 10	Semi Annual Event May 11	Annual Event Nov 11	Semi Annual Event May 12	Annual Event Nov 12
MW-02A	92	-	758	-	648	-	343	-	85	-	270
MW-03B	0.3	-	BQL	-	0.2	-	0.3	-	0.3	-	BQL
MW-08B	1.2	1	1	1	1.4	17	1	2	1.1	0.4	0.8
MW-09B	BQL	-	BQL	-	BQL	-	0.1	-	BQL	-	BQL
MW-10B	192	173	169	167	189	170	218	199	165	122	81
MW-11B	0.6	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
MW-12B	118	88	98	124	84	139	115	179	108	147	106
MW-13B	51	-	23	-	30	-	31	-	67	-	18
MW-15B	29	-	23	-	23	-	28	-	18	-	13
MW-16B	64	-	44	-	BQL	-	35	-	21	-	53
MW-17B	2	-	BQL	-	BQL	-	BQL	-	BQL	-	BQL
MW-18B	0.5	-	0.7	-	BQL	-	BQL	-	BQL	-	BQL
MW-19B	BQL	BQL	0.2	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
MW-20B	1.7	0.5	BQL	BQL	BQL	16	BQL	BQL	BQL	BQL	BQL
MW-21B	BQL	0.5	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
MW-22B	230	201	166	181	166	172	162	148	112	133	85
MW-23B	193	-	65	-	0.3	-	55	-	34	-	45
MW-24B	103	-	256	-	BQL	-	286	-	248	-	242
MW-25B	22	-	21	-	BQL	-	17	-	10	-	23
MW-03C	-	-	-	-	-	-	-	-	-	-	-
MW-04C	-	-	-	-	-	-	-	-	-	-	-
MW-09C	-	-	-	-	-	-	-	-	-	-	-

Southwest Area	SWAI Oct 07	SWAI Apr 08	SWAI Oct 08	SWAI May 09	SWAI Dec 09	SWAI May 10	SWAI Nov 10	SWAI May 11	SWAI Nov 11	SWAI May 12	SWAI Nov 12
TP-01	-	-	-	-	-	-	-	-	-	-	-
TP-02	-	-	-	-	-	-	-	-	-	-	-
TP-03	BQL	BQL	BQL	NS	BQL	BQL	BQL	4	BQL	BQL	BQL
TP-04	51	37	34	35	25	31	39	27	32	23	31

Recovery Well	Annual Event Oct 07	Semi Annual Event Apr 08	Annual Event Oct 08	Semi Annual Event May 09	Annual Event Dec 09	Semi Annual Event May 10	Annual Event Nov 10	Semi Annual Event May 11	Annual Event Nov 11	Semi Annual Event May 12	Annual Event Nov 12
RW-01	-	-	-	0.2	0.2	16	6	BQL	0.2	9	0.9
RW-02	109	97	71	81	90	101	124	39	86	119	112
RW-03	-	-	-	-	-	-	-	-	-	-	-
RW-04	144	137	145	118	122	114	166	133	128	117	91
RW-05	122	98	98	89	72	69	58	76	71	65	58
RW-06	347	300	290	242	222	229	170	198	187	180	172
RW-07	56	46	43	36	29	26	19	28	22	20	21
RW-08	46	39	43	58	60	37	38	6	31	33	38

Notes :

All results reported as ug/L
BQL = Below Quantitation Limit
* - Total VOCs is the sum of all values, including B- and J-qualified results.

APPENDIX D

FIGURES

Figure 1
Site Location Map
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

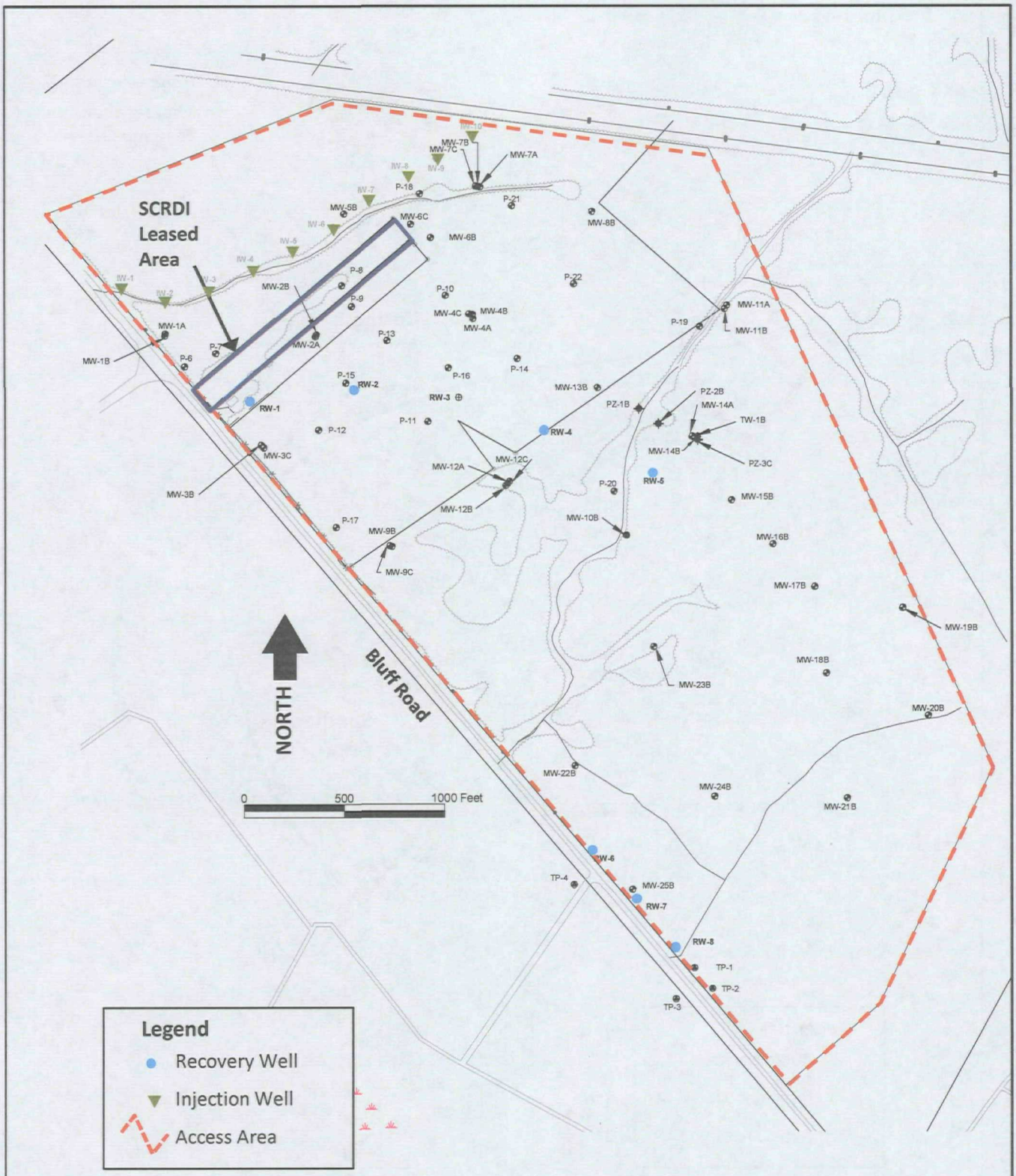


Figure 2
Site Map
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

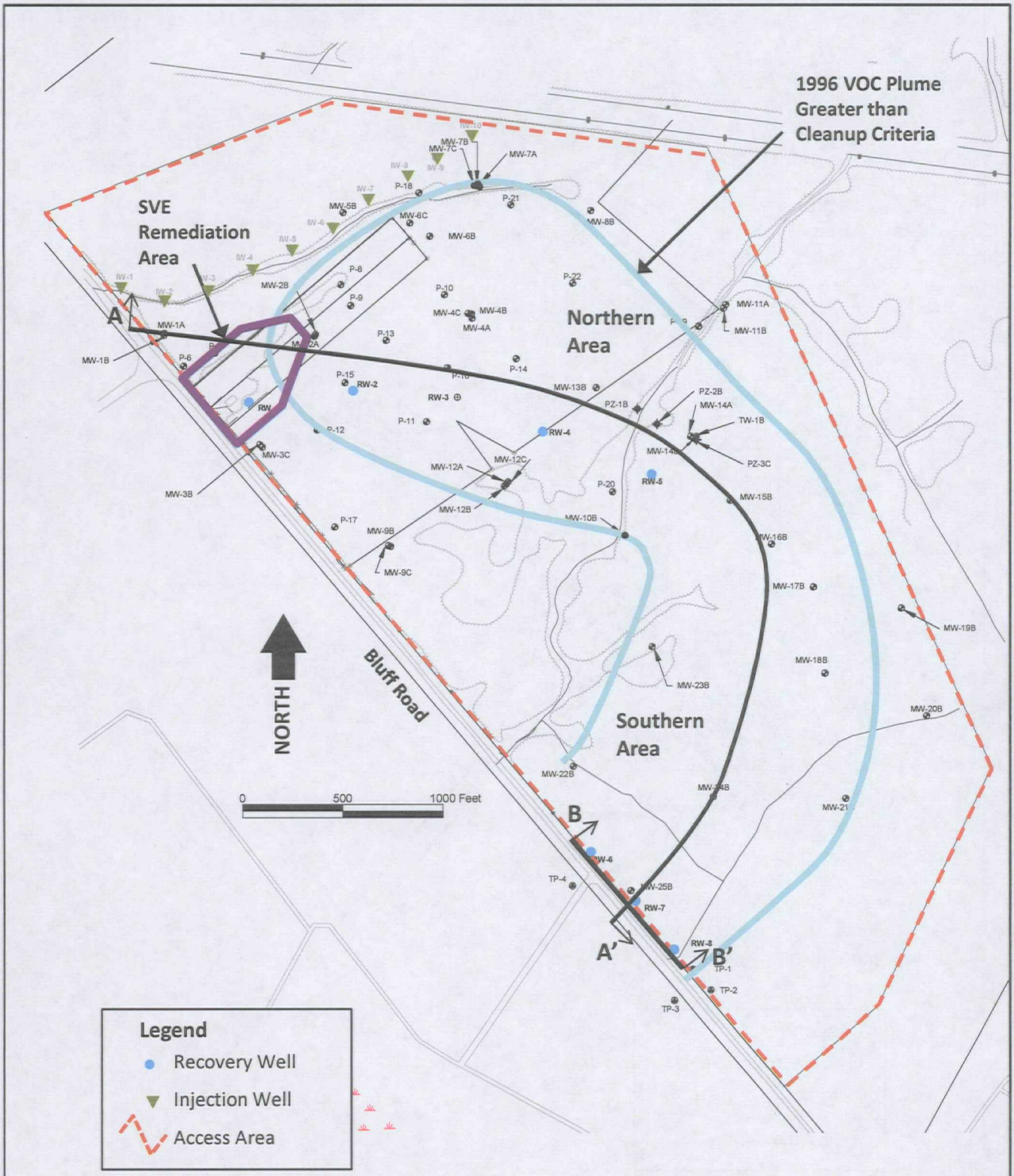
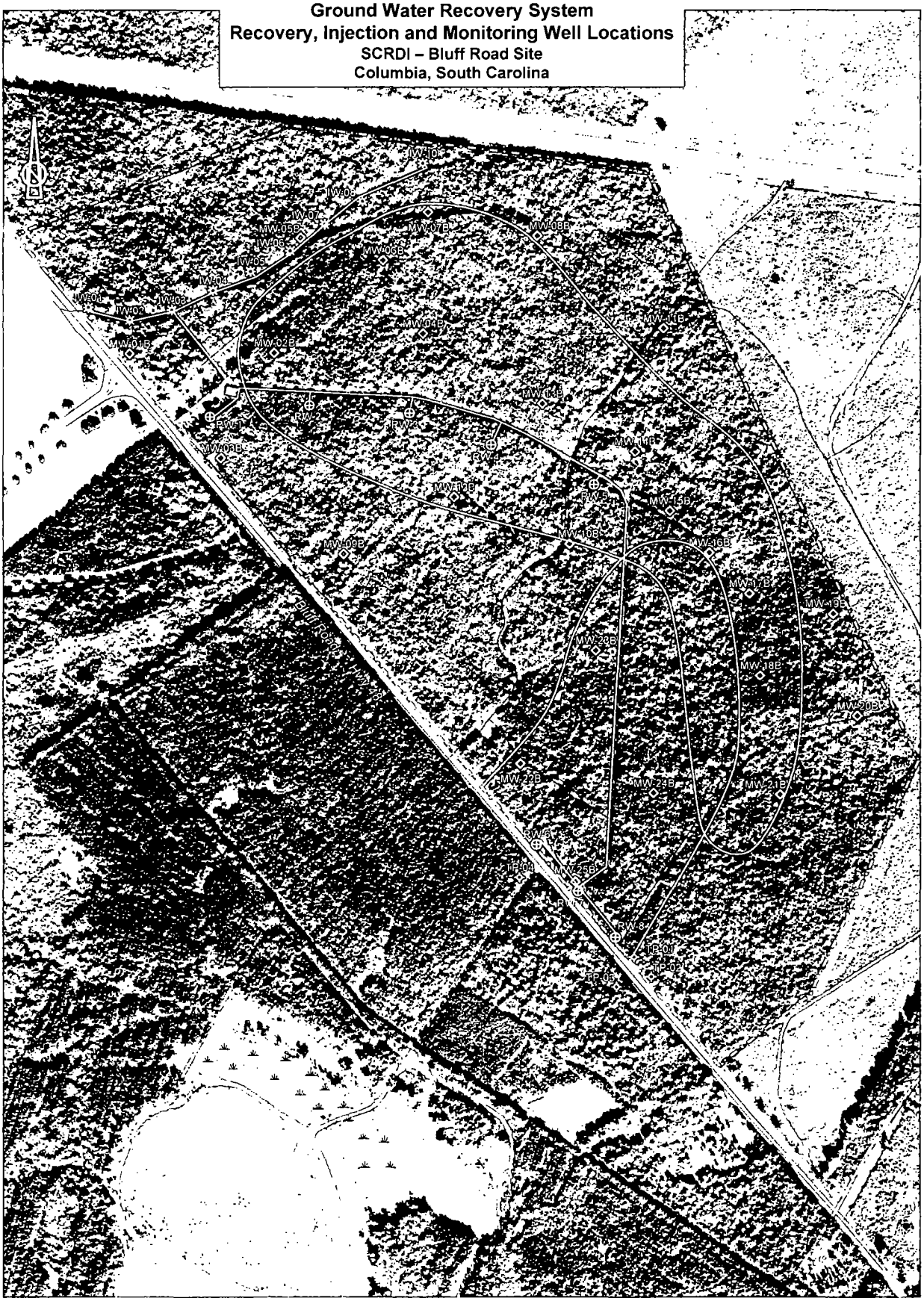


Figure 3
VOC Plume, SVE Area and Cross Section Locations
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

Figure 4

Ground Water Recovery System
Recovery, Injection and Monitoring Well Locations
SCRDI – Bluff Road Site
Columbia, South Carolina



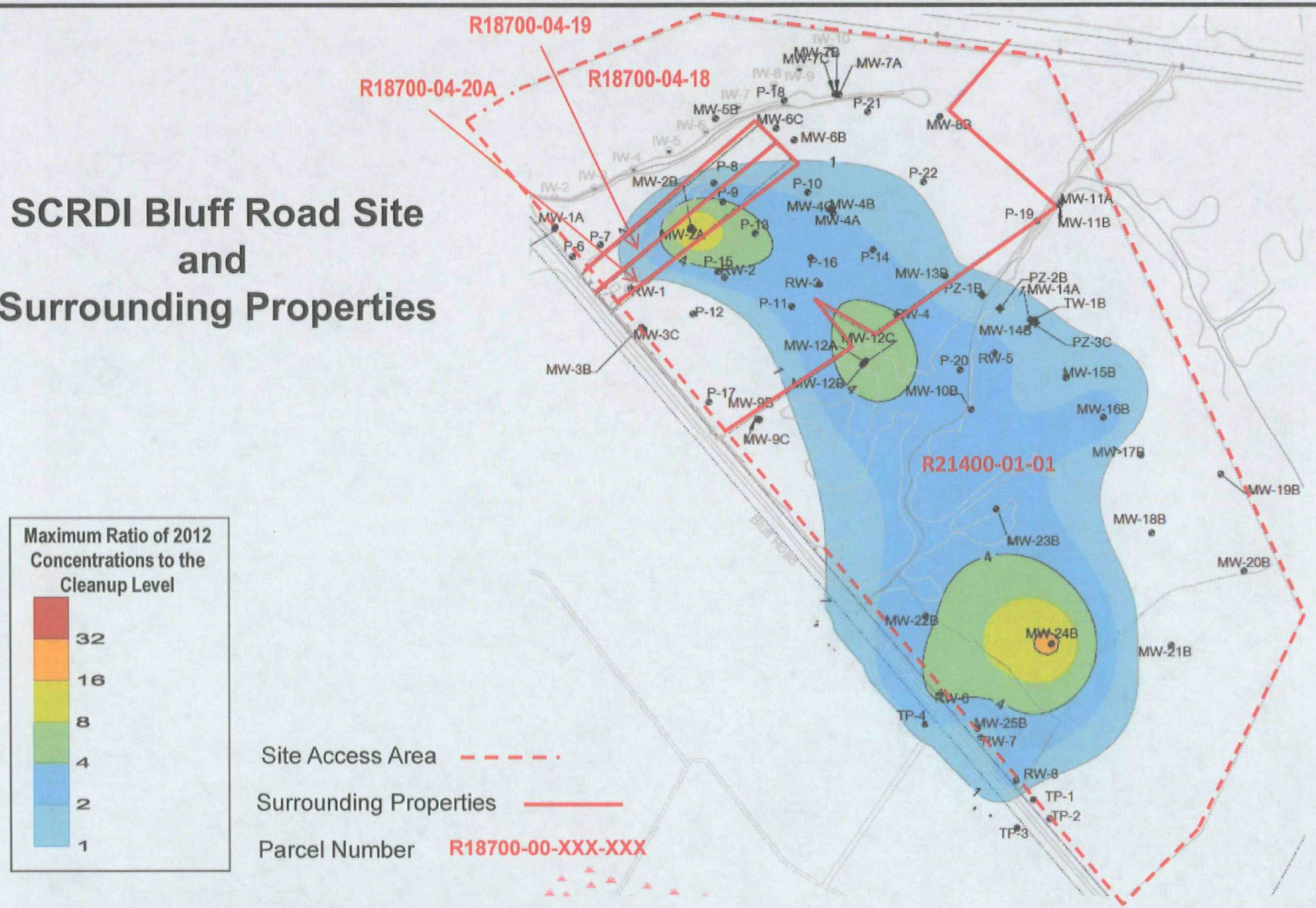
0 500 1,000

Scale in Feet

Legend

- ⊕ RW-3 Recovery Well
- ✲ IW-03 Injection Well
- ◇ MW-22B Monitoring Well
- ◇ TP-03 Temporary Piezometer
- Delivery Lines and Access Roads
- Acquisition Area
- Isoline for Ground Water at Target Cleanup Levels (ERM 1996)

SCRDI Bluff Road Site and Surrounding Properties



Maximum Ratio of 2012 Concentrations to the Cleanup Level

- 32
- 16
- 8
- 4
- 2
- 1

Site Access Area

Surrounding Properties

Parcel Number R18700-00-XXX-XXX

SCRDI Bluff Road, Richland County, SC
September 2013

Figure 5

Figure 6
Potentiometric Surface Map
26 November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

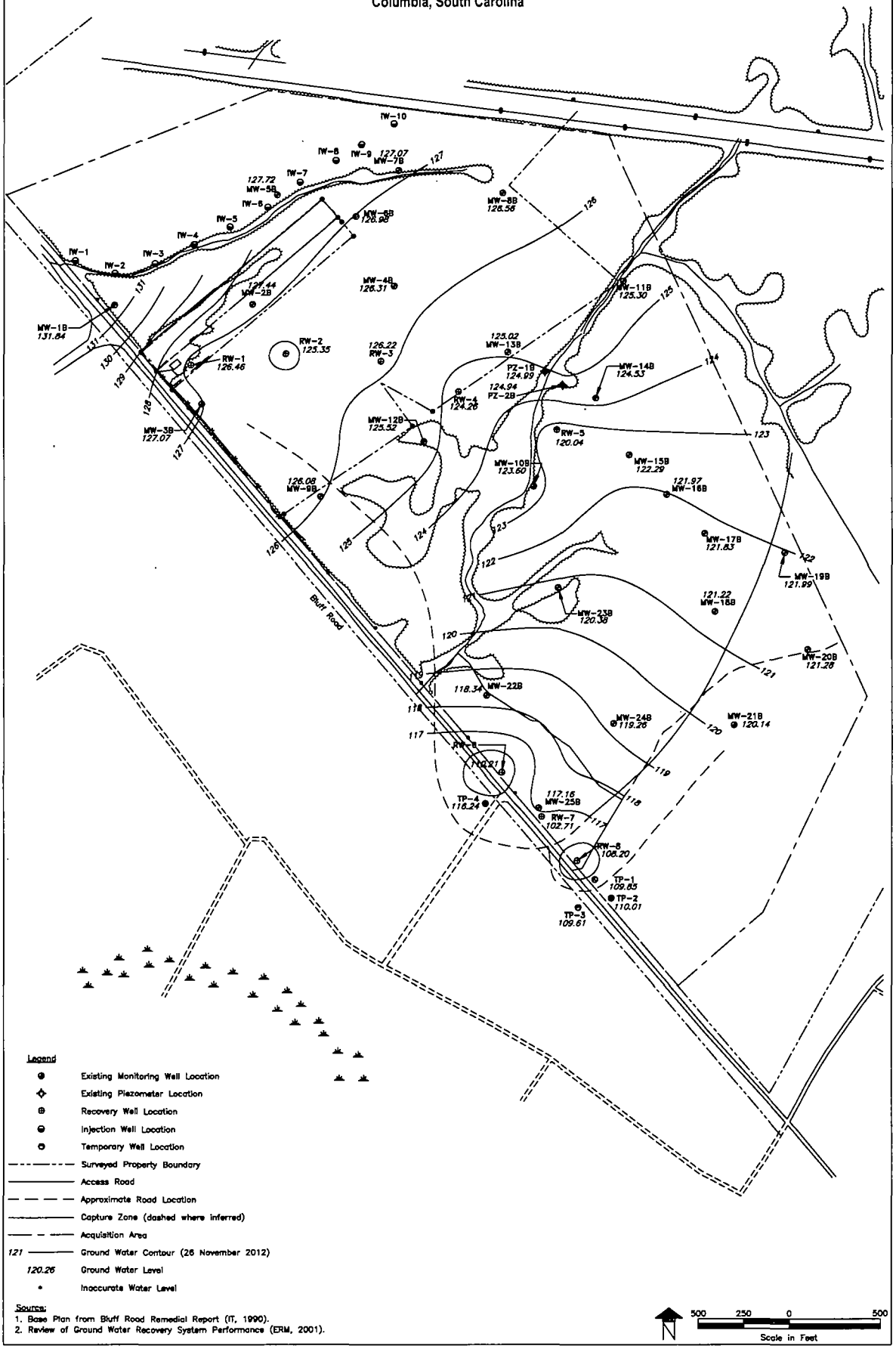
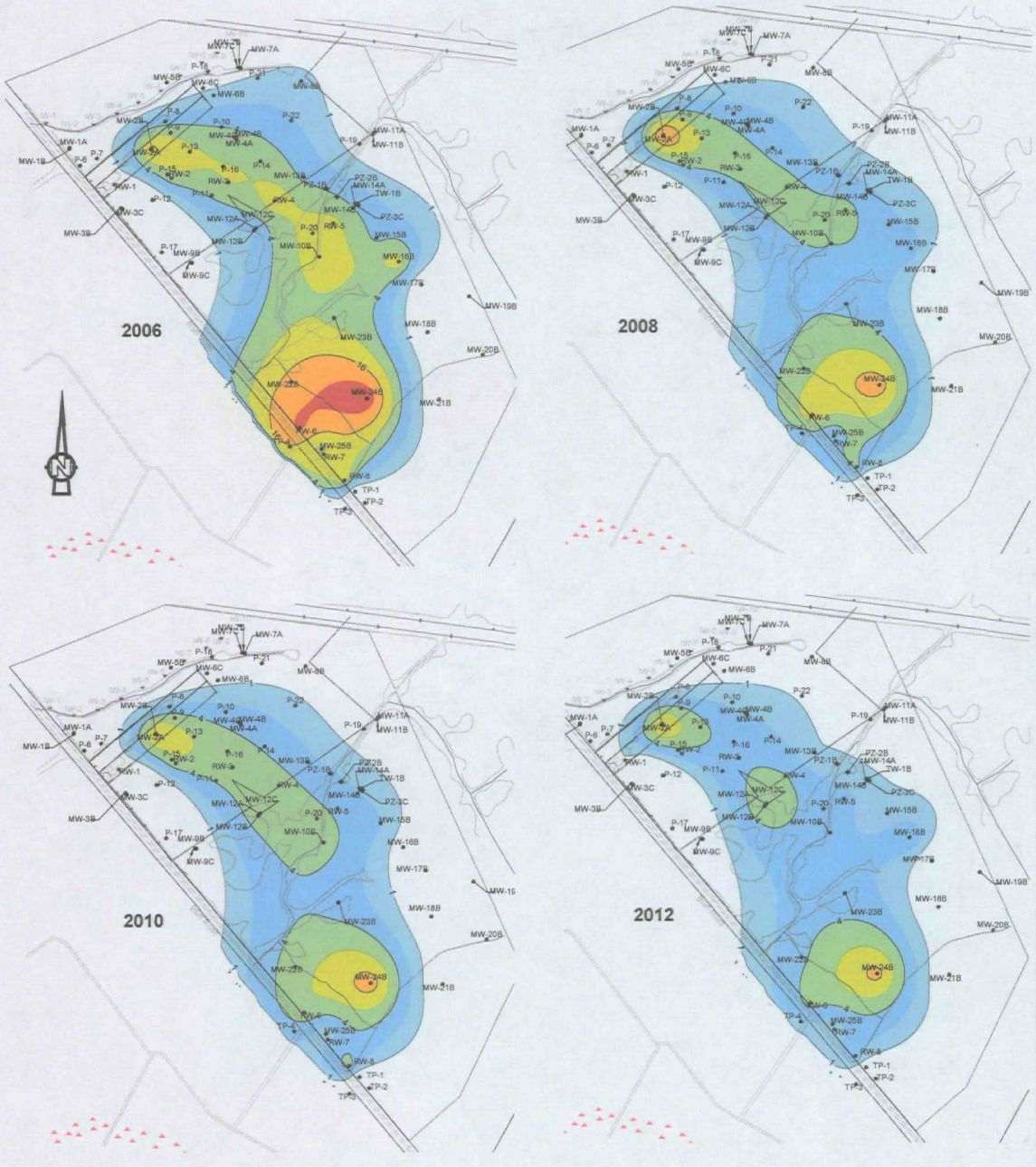


Figure 7

Exceedance of Ground Water Cleanup Criteria

SCRDI – Bluff Road Site

Columbia, South Carolina



Notes:

Contours present the ratio of observed concentration to cleanup level.

The contoured values are the maximum ratio at each well during the year.

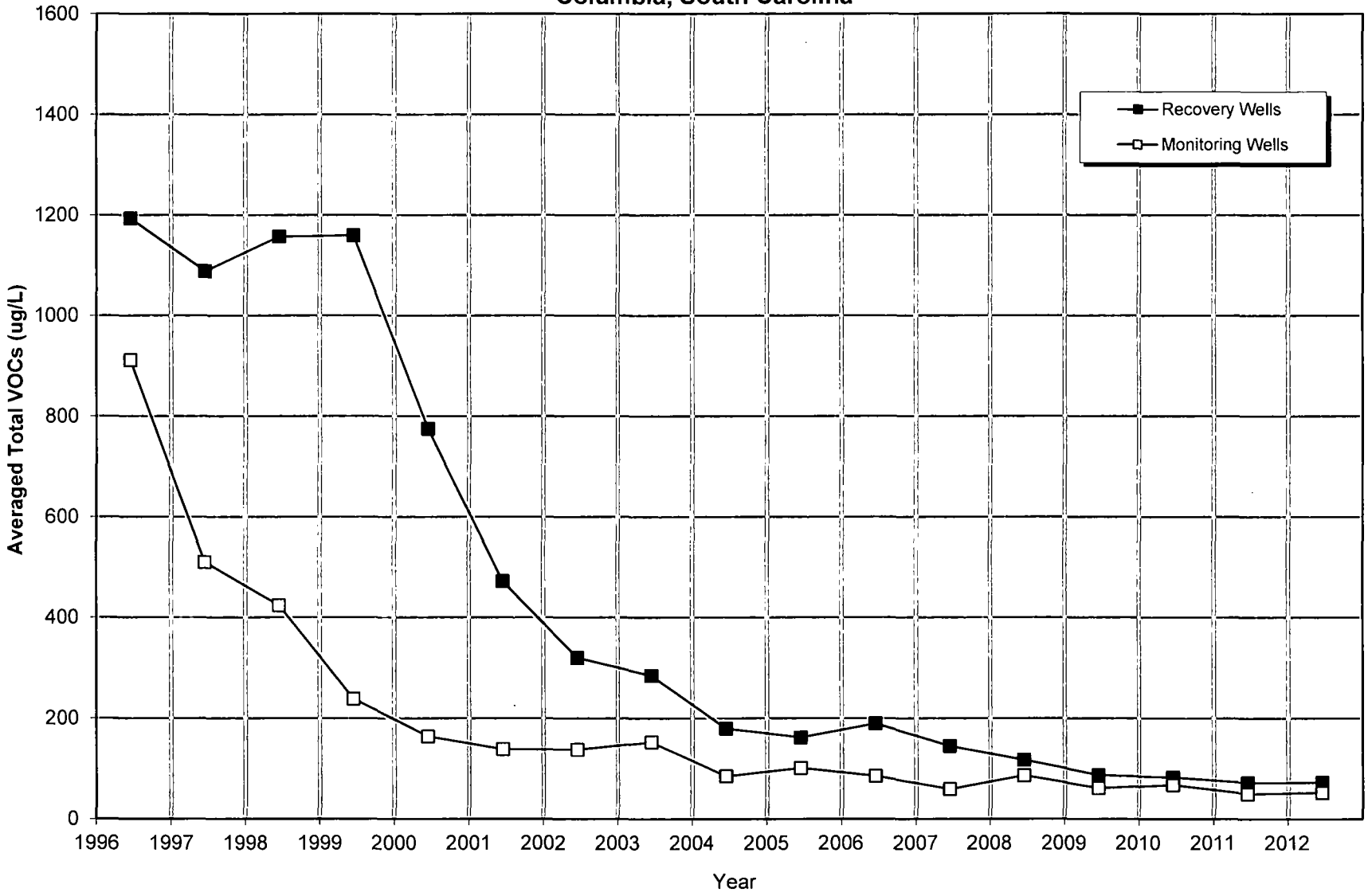
The maximum ratio may be for any parameter analyzed for.

Only parameters with Site cleanup levels used.

Acetone and B-qualified data are not included.

Figure 8

Average Ground Water Concentrations
SCRDI Bluff Road Site
Columbia, South Carolina



APPENDIX E

SITE INSPECTION CHECK FORM, INTERVIEW DOCUMENTATION FORM AND PHOTOGRAPHS

Appendix E: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site name: SCRDI Bluff Road	**Date of inspection:** October 30, 2012
Location and Region: Bluff Road, Columbia, SC	**EPA ID: SCD000622787**
Agency, office, or company leading the five-year review: EPA, SCDHEC, de maximis, inc. and O&M, inc.	**Weather/temperature:** Slight overcast

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Please refer to the Site Interview Documentation Form)

1. **O&M site manager** Anton Plaines (Name) | Project Manager (Title) | 11/12/2013 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 727-823-2100
   Problems, suggestions; ☐ Report attached Additional Discussion – Interview Form Attached

2. **O&M staff** James Scott Ingles (Name) | Licensed Operator (Title) | 12/02/2013 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 803-530-8989
   Problems, suggestions; ☐ Report attached Additional Discussion – Interview Form Attached

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency _____
   Contact _____ (Name) _____ (Title) ___/___/___ (Date) _____ (Phone No.)
   Problems; suggestions; ☐ Report attached _____

   Agency _____
   Contact _____ (Name) _____ (Title) ___/___/___ (Date) _____ (Phone No.)
   Problems; suggestions; ☐ Report attached _____

   Agency _____
   Contact _____ (Name) _____ (Title) ___/___/___ (Date) _____ (Phone No.)
   Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
	☒ As-built drawings	☒ Readily available	☒ Up to date	☒ N/A
	☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
2.	**Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
	☒ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
3.	**O&M and OSHA Training Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
4.	**Permits and Service Agreements**			
	☒ Air discharge permit	☒ Readily available	☒ Up to date	☐ N/A
	☒ Effluent discharge	☒ Readily available	☒ Up to date	☐ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☐ N/A
	☐ Other permits _____	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
9.	**Discharge Compliance Records**			
	☒ Air	☐ Readily available	☐ Up to date	☐ N/A
	☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A
	Remarks Air and water (effluent) discharge is reported monthly via the site monthly progress reports.			
10.	**Daily Access/Security Logs**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State

☒ PRP in-house ☒ Contractor for PRP

☐ Federal Facility in-house ☐ Contractor for Federal Facility

☐ Other _____

2. **O&M Cost Records**

☒ Readily available ☒ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate Approximately $636K (10 Years)/ $898K (30 Years) ☐

Total annual cost by year for review period if available

From 09/30/2008 (Date) To 08/30/2013 (Date) $280,000 annually.

3. **Unanticipated or Unusually High O&M Costs During Review Period**

None

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks:

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks:

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

Type of monitoring (e.g., self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ __/__/__ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

_____

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A

Remarks: Options for ground water and land use restrictions should be evaluated.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: There was no evidence of vandalism.

2. **Land use changes on site** ☒ N/A

Remarks: _____

3. **Land use changes off site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. Roads damaged ☒ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1.	**Pumps, Wellhead Plumbing, and Electrical** ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks:
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☒ Good condition ☐ Needs Maintenance Remarks: _____
3.	**Spare Parts and Equipment** ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks: _____
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable ☒ N/A
1.	**Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks: _____
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks: _____
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks: _____
C. Treatment System	☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☒ Air stripping ☒ Carbon adsorbers

☒ Filters Poly bag filter unitss

☐ Additive (e.g., chelation agent, flocculent) _____

☐ Others _____

☒ Good condition ☐ Needs Maintenance

☒ Sampling ports properly marked and functional

☒ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

☒ Quantity of ground water treated annually. **Approximately 60 million gallons per year.**

☐ Quantity of surface water treated annually _____

Remarks: The Granular Activated Carbon (GAC) treatment was never used since the Air Stripping process operated as designed and reduced VOC concentrations in extracted ground water to levels below the NPDES permit discharge limits. The effluent samples have been non-detect for many years. The site still has to be inspected about once per month.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☒ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ Wells can be easily located - Site Plan w/ photographs is available in the Treatment Building. ☐ Needs Maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring data suggests:**

☒ Groundwater plume is effectively contained in most areas. ☒ Contaminant concentrations are declining (some what)

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs Maintenance ☒ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. **(NA)**

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Please refer to the text in the 2013 Five-Year Review Report and the Interview Documentation Forms provided by representatives of de maximis, inc. and O&M, Inc.

B. Adequacy of O&M

Please refer to the text in the 2013 Five-Year Review Report and the Interview Documentation Forms provided by representatives of de maximis, inc. and O&M, Inc.

C. Early Indicators of Potential Remedy Problems

Please refer to the text in the 2013 Five-Year Review Report and the Interview Documentation Forms provided by representatives of de maximis, inc. and O&M, Inc.

D. Opportunities for Optimization

Please refer to the text in the 2013 Five-Year Review Report and the Interview Documentation Forms provided by representatives of de maximis, inc. and O&M, Inc.

Appendix E: Interview Documentation Form
Interview Form for the Third SCRDI Bluff Road Site Five-Year Review

Site Name: SCRDI Bluff Road **EPA ID No.:** SCD000622787

Interviewer Name: Yvonne O. Jones

Affiliation: US EPA

Subject's Name: James Scott Ingles **Affiliation:** O&M, Inc.
Licensed Operator
Groundwater Treatment
System operations

Subject's Contact Information: (803) 530-8989 james.scott.ingles@gmail.com

Time:_____ **Date:** 12/02/2012 **Type of Interview:** _____

SEE ATTACHED FORMS COMPLETED FOR INTERVIEW QUESTIONS (BELOW)

1. **What is your impression of the project? (general sentiment)**

2. **Is the remedy functioning as expected? How well is the remedy performing?**

3. **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?**

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If, there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.**

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.**

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.**
8. **Do you have any comments, suggestions, or recommendations regarding the project?**

Name: James Scott Ingler Date: 12/2/12 Method:

1. What is your overall impression of the project? (general sentiment)

The project is going along well. We are meeting our goals and continuing to process water.

2. Is the remedy functioning as expected? How well is the remedy performing?

Yes. As the operator I keep the system running as much as possible. The performance is determined by demaximis

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

As the operator the information I have been given shows the levels decreasing

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Staff - operator J.S. Ingler, back up A. Plaines, site

inspection is daily and shutdowns are monitored by the PLC and dials the operator to make repairs or restart system.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

Changes since startup:

injection well redevelopment – O+M built a pump system to redevelop our injection wells – result better operations + huge savings this allows us to redevelop the injection wells on our schedule so our injection wells never cause downtime for the system.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

There have been many. example – when trying to pig the RW-2 line for the first time we found the pigging station had been installed backwards. When this was repaired we attempted to pig (clean) the line and found a flaw in the HDPE that would not allow the pig to pass through the line. solution – have Roto Rooter shoot the l

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

see injection well set up above #5.

8. Do you have any comments, suggestions, or recommendations regarding the project?

Keep everything going the way it is as it seems to be working. Never fix what isn't broke

Jane S Ingle

Operator # 05525 SCLIC #

Extra Space

Appendix E: Interview Documentation Form
Interview Form for the Third SCRDI Bluff Road Site Five-Year Review

Site Name: SCRDI Bluff Road **EPA ID No.:** SCD000622787

Interviewer Name: Yvonne O. Jones

Affiliation: US EPA

Subject's Name: Anton Plaines **Affiliation:** O&M, Inc.
Project Manager
Groundwater Treatment
System operations

Subject's Contact Information: (727) 823-2100 aplaines@oandm-inc.com

Time:_____ **Date: 11/21/2012** **Type of Interview:** _____

SEE ATTACHED FORMS COMPLETED FOR INTERVIEW QUESTIONS (BELOW)

1. **What is your impression of the project? (general sentiment)**

2. **Is the remedy functioning as expected? How well is the remedy performing?**

3. **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?**

4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If, there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.**

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.**

6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**

7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.**

8. **Do you have any comments, suggestions, or recommendations regarding the project?**

Name: Anton Plaines Date: 11/21/12 Method:

1. What is your overall impression of the project? (general sentiment)

The project is continuing to proceed in an efficient and protective manner.

2. Is the remedy functioning as expected? How well is the remedy performing?

Yes. The remedy continues to reduce and contain groundwater contaminant concentrations.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

The monitoring data shows that contaminant levels are decreasing

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

There is a daily, on-site, licensed wastewater

treatment operator on-site.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

There have not been significant changes in operations, maintenance or sampling.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

There have not been any unforseen or unexpected O&M difficulties.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

Opportunities for optimization and efficiencies are constantly being evaluated. I'm not aware of any recent, significant changes.

8. Do you have any comments, suggestions, or recommendations regarding the project? No

Extra Space

Appendix E: Interview Documentation Form
Interview Form for the Third SCRDI Bluff Road Site Five-Year Review

Site Name: SCRDI Bluff Road **EPA ID No.:** SCD000622787

Interviewer Name: Yvonne O. Jones

Affiliation: US EPA

Subject's Name: John Stiles **Affiliation:** *de maximis, inc.* **Project Manager**

Subject's Contact Information: (865) 691-5052 jstiles@demaximis.com

Time:_____ **Date:** 11/19/2012 **Type of Interview:** _____

SEE ATTACHED FORMS COMPLETED FOR INTERVIEW QUESTIONS (BELOW)

1. **What is your impression of the project? (general sentiment)**
2. **Is the remedy functioning as expected? How well is the remedy performing?**
3. **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?**
4. **Is there a continuous on-site O&M presence? If so, please describe staff and activities. If, there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.**
5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.**
6. **Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.**
7. **Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.**
8. **Do you have any comments, suggestions, or recommendations regarding the project?**

Name: John Stiles Date: 19 November 2012 Method:

1. What is your overall impression of the project? (general sentiment)

The pump and treat system for groundwater remediation is performing well. Groundwater contamination levels for the site contaminants of concern, volatile organic compounds, are declining. The pump and treat system is adequately maintained.

2. Is the remedy functioning as expected? How well is the remedy performing?

Yes. The level of groundwater contamination has declined over 90%.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

The trend for the monitoring data show that groundwater contamination levels are decreasing, have declined over 90%, and are continuing to decline after 15 years of pump and treat operations.

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Yes. Staff activities include maintenance

of pumps and motors, recovery and injection wells, and emergency repairs as needed. There is one treatment system operator who visits the site as needed and usually 5 days a week.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

No. There have not been any significant changes in O & M requirements, or maintenance schedules.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

Iron levels have been an issue for O&M but the iron issue has been handled with routine cleaning and maintenance.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

The pump and treat system has worked well, groundwater contamination levels are dropping and have decreased over 90%. Recovery well pump controllers have been updated as needed, to more modern units, allowing fewer shutdowns due to power supply variations. Other minor changes have been made to improve operations.

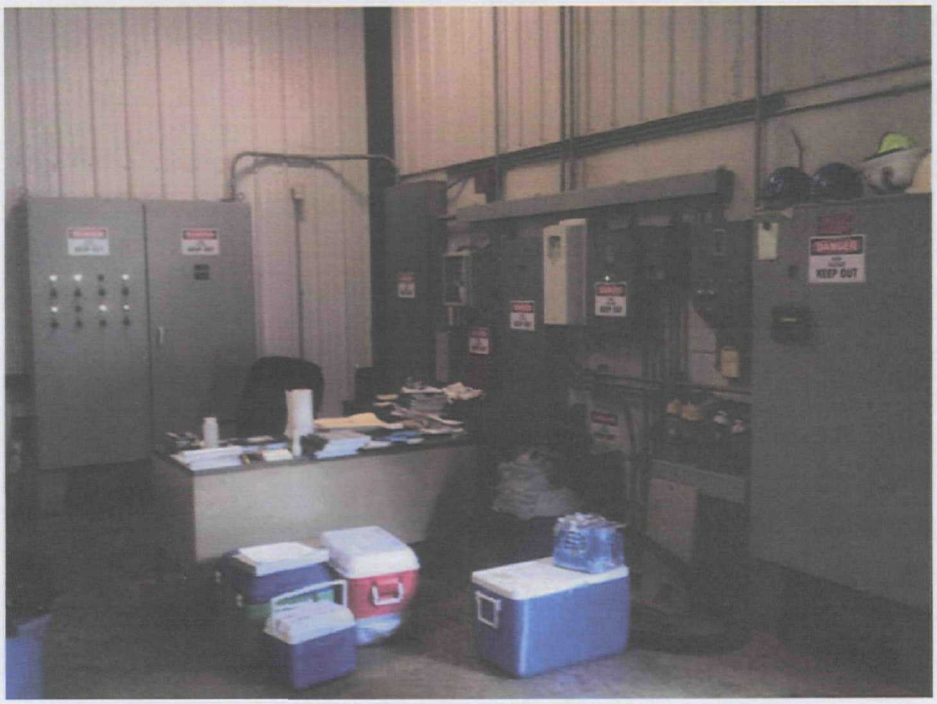
8. Do you have any comments, suggestions, or recommendations regarding the project?

I have no other comments, suggestions, or recommendations.

Extra Space

Appendix E:
Site Photographs
SCRDI Bluff Road Site
Third Five-Year Review

Photograph 1: Recovery Well



Photograph 2: Work Area and Control Panels.

Photograph 3: Air Stripper and Blower

Photograph 4: Air Strippers

Photograph 5: Influent Header

Photograph 6: Granular Activated Carbon Units

APPENDIX F

REVIEW OF GROUND WATER RECOVERY SYSTEM PERFORMANCE SCRDI BLUFF ROAD SITE COLUMBIA, SOUTH CAROLINA

REPORT

SCRDI-Bluff Road Site Performing Settlors

Review of Ground Water Recovery System Performance *SCRDI-Bluff Road Site Columbia, South Carolina*

20 August 2013

Services Environmental, Inc
375 Morgan Street
Phoenixville, PA

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1.0 *INTRODUCTION*

This report presents an evaluation of the ground water recovery system (GWRS) performance at the SCRDI-Bluff Road Site (the Site) in Columbia, South Carolina. The GWRS is designed to capture the volatile organic compound (VOC) plume (the plume) within the Site Access Area. The initial performance evaluation of the GWRS is documented in the following reports:

- *Post-startup Monitoring Plan*: ERM, 2 June 1996
- *Remedial Action Report*: ERM, 21 November 1996
- *Capture Zone Evaluation*: ERM, 25 November 1997
- *Southwest Area Investigation (SWAI) Report*: ERM, 12 January 1998
- *Response to Comments on the SWAI Report*: ERM, 17 April 1998

Annual reports with a format similar to this document have been completed since 1998 to document the performance of the GWRS. A conceptual site model (CSM) was prepared in 2013 and is included in Attachment A.

Capture of the plume is a primary remedial system performance goal identified in the Remedial Action Report (1996). Capture evaluations are based on an analysis of the ground water potentiometric surface map and of the change in hydraulic gradient between selected well pairs. The evaluations completed to date have all concluded that the ground water recovery is effectively containing the plume.

In addition to the above mentioned documents that describe the actual performance of the GWRS, the following documents provide additional background on the GWRS design and monitoring program:

- *Design Criteria Report: Issued 22 August 1995*; Amended, ERM, 8 November 1995
- *Remedial Design Amendment*: ERM, 8 November 1995
- *Operation and Maintenance Plan*: ERM, 18 June 1996
- *Performance Standards Verification Plan*: Appendix C of the Operation and Maintenance Plan: ERM, 18 June 1996

Data on ground water quality and system operation are submitted to the US Environmental Protection Agency Region IV in Monthly Progress Reports prepared by de maximis, inc. (de maximis).

The United States Environmental Protection Agency (USEPA) completed two Five Year Reviews of the remedy at the Site:

- *Final – First Five Year Review Report, SCRDI – Bluff Road Superfund Site – Richland County, South Carolina* (prepared by the United States Army Corps of Engineers for the USEPA): April 2003.
- *Final – Second Five Year Review Report, SCRDI – Bluff Road Superfund Site – Richland County, South Carolina*: September 2008.

Both of these reviews found the GWRS to be performing effectively. It is expected that the USEPA will complete a third Five Year Review during 2013.

The following sections review the basis of the system design and present an evaluation of the ground water quality and water level data collected during the 2012 semi-annual and annual monitoring events.

1.1 SYSTEM DESCRIPTION

The GWRS at the Site was constructed in 1996 and began operation in August 1996. The GWRS was designed with eight ground water recovery wells (RW-01 to RW-08) and ten injection wells (IW-01 to IW-10). All of these wells are completed in the shallow alluvial aquifer system. Extracted ground water is treated by air stripping and carbon polishing. Treated ground water is recharged to the shallow aquifer via the ten injection wells. The injection wells are in an area demonstrated to be upgradient of the VOC plume.

Figure 1 presents the locations of the recovery and injection wells, monitoring wells, and a delineation of the VOC plume prior to the startup of the GWRS. This depiction of the VOC plume is taken from the *Remedial Action Report* (ERM, 1996). For the purpose of discussion, the VOC plume had been divided into the northern and southern plumes. The division is based on a change in ground water flow direction just south of recovery well RW-05.

Recovery wells RW-01 to RW-05 are located along the axis of the northern plume. Recovery wells RW-06 to RW-08 are located in the southern plume along Bluff Road, at the southwest limit of the Site Access Area.

Wells RW-06, RW-07, and RW-08 were designed to be the primary wells effecting hydraulic capture. Based on the balance between pumping rates and the natural ground water flow rate, wells RW-06 and RW-07 alone can contain the entire VOC plume. Recovery well RW-08 provides additional capture of VOCs outside of the RW-06 and RW-07 capture zone. Recovery wells RW-01 to RW-05 were designed to maximize VOC mass removal in the northern plume, where the highest concentrations were, and enhance containment.

1.2 *SYSTEM DESIGN AND OPERATION*

As presented in the *Remedial Action Report* (ERM, 1996), the GWRS was designed to pump approximately 80 gpm from RW-01 to RW-05 in the northern portion of the plume, and an additional 55 to 60 gpm from RW-06 to RW-08 in the southern portion of the plume. These pumping rates were based on the ground water modeling and have been refined based on the drawdown observed during operation of the GWRS. In 2012, the average total pumping rate from the northern recovery wells was 73 gpm, and 53 gpm from the southern recovery wells. These rates are sufficient to maintain plume capture.

Ground water modeling results presented in the *Remedial Design and Performance Standards Verification Plan* (ERM, 1996) demonstrated that the principal plume containment would be achieved by the southern recovery wells RW-06, RW-07, and RW-08. These three wells can contain the entire plume by themselves. The northern recovery wells create a less distinct cone of depression due to the very high aquifer transmissivity. In addition, reinjection of treated ground water into wells IW-01 to IW-10 minimizes the drawdown effected by the northern recovery wells. These northern recovery wells essentially recirculate water with the injection wells, isolating the ground water in this portion of the plume and enhancing ground water flushing.

The aquifer flushing provided by reinjection should reduce cleanup time. In practice however, the benefits are generally less than predicted due to the affects of adsorption and diffusion of the site-related organic compounds on and into the aquifer matrix. In addition, the pumping rate required to contain the plume is also increased as a result of the upgradient reinjection of ground water.

As noted in previous reports, modifications to the system pumping rates have been made to address the field conditions encountered after the construction and system startup:

1. Recovery well RW-01 was shutdown in May 2007 as recommended in the previous annual report. With the exception of one anomalous analytical result in 1997, the VOC levels in RW-01 have never exceeded a Cleanup Criterion and pumping the well provided no remedial benefit. RW-01 was restarted in 2009 to provide water to dilute the high iron concentrations entering the ground water treatment system.

2. The iron levels in well RW-03 were significantly higher than anticipated during the system design; RW-03 exhibited iron levels of approximately 40,000 ug/L. These levels remained high even after several months of operation and created significant maintenance problems with the treatment system. Therefore, RW-03 was shut down and has not been operated since 1997. Operation of this well is not critical to the containment of the plume.

3. Pumping rates at the southern recovery wells were set in response to well yields and drawdown observed under operating conditions. Based on the capture performance observed since system startup, the current rate of pumping from these wells is sufficient to maintain capture.

The recovery well and injection well flow rates for 2012 are presented in Table 1.

1.3 *TECHNIQUES OF RECOVERY SYSTEM PERFORMANCE EVALUTION*

The hydraulic performance of the ground water recovery system has been evaluated using two different techniques to cross-check the conclusions and enhance the degree of confidence in the assessment. These techniques are discussed below and the results are presented in Section 2. Ground water quality data were reviewed to the extent that it provides an indication of the performance of the recovery system in attaining capture.

1.3.1 *Contouring of Ground Water Levels*

Hydraulic containment is most commonly assessed by contouring the ground water potentiometric surface. Ground water flow patterns and capture are determined by drawing flow lines normal to the potentiometric contours. Because of the low hydraulic gradients at the Site, the GWRS achieves capture without developing large drawdowns. This was demonstrated in the ground water modeling presented in the *Remedial Design Amendment* (ERM, 1995). As a result, interpretation of

capture from the potentiometric data is highly subjective. To supplement the interpretation of the potentiometric surface, a method of comparing water level relationships in well pairs was developed and is described below.

1.3.2 *Well Pair Comparison Methodology*

The comparison of ground water levels in monitoring well pairs was proposed in the *Performance Standards Verification Plan* (ERM, 1996) to supplement the capture zone analysis from the ground water potentiometric surface contours. The well pair method compares observed changes in hydraulic gradient effected by the GWRS operation to changes predicted in the Remedial Design modeling. The Remedial Design modeling determined the gradient changes required to effect capture of the defined plume. The well pair comparison is a method of very reliably measuring these gradient changes. Compared to conventional ground water level contouring, well pair comparisons are particularly useful where:

- the cones of depression developed are not steep (e.g., in very transmissive aquifers);
- the hydraulic gradients are low (therefore a large drawdown is not required to achieve containment); and
- the natural fluctuation of the ground water table is larger than the measurable drawdown.

Figure 2 presents an example of a well pair comparison graph; ground water levels in one well are plotted against those in another well; MW-21B versus MW-24B in this case. Each point on the graph represents data from one monitoring event. The data points are filled boxes prior to startup of the GWRS and open boxes after startup. A solid line is drawn to represent the average water level conditions prior to the startup of the GWRS. A dashed line represents the average condition for 2012. The difference between these two lines is used to assess the gradient change.

Under stable aquifer conditions, i.e., no change in pumping, nearby wells screened in the same aquifer will rise and fall uniformly with seasonal water level fluctuations, i.e., if one well goes up one foot, the nearby wells will also increase approximately one foot. As a result, the difference in water levels between two wells completed in the same aquifer is relatively constant regardless of the seasonal rise and fall of the aquifer potentiometric surface. As shown in Figure 2, prior to the GWRS startup the ground water levels fluctuated by about three feet in both MW-21B

and MW-24B, and the water levels were approximately equal. After the GWRS began operation, a new head relationship was established. Once the aquifer response to pumping had stabilized, the potentiometric surface again rises and falls uniformly. However, the relative water levels in MW-21B and MW-24B are different than the pre-pumping conditions. With the GWRS operating, the water level in MW-24B is approximately 0.89 feet lower than MW-21B for the 2012 data.

Ground water modeling was used to determine the cone of depression required to achieve capture. The change in head relationships between well pairs from non-pumping to pumping conditions was determined from the modeled cone of depression. A well pair comparison, as shown in Figure 2, accurately demonstrates whether or not the cone of depression established by the GWRS is as large as the cone of depression predicted by modeling, i.e., required to maintain plume capture.

The Remedial Design modeling predicted a drawdown of 0.94 feet and 1.40 feet at wells MW-21B and MW-24B, respectively. The difference, 0.46 feet (1.40 ft - 0.94 ft), is the predicted change in the head relationship created by pumping the GWRS. Where the observed change in the head relationship equals or exceeds the change predicted by modeling, the performance of the GWRS equals or exceeds the performance simulated in the Remedial Design modeling. At MW-21B and MW-24B, the change in head relationship, ~0.89 feet in 2012, is greater than the predicted change, 0.46 feet. Thus, in the vicinity of MW-21B and MW-24B, the actual GWRS performance exceeds the predicted performance.

2.0 *EVALUATION OF RESULTS*

2.1 *GROUND WATER CONTAINMENT*

Table 2 presents the ground water level data from startup of the GWRS (August 1996) through 2012. Ground water levels were measured in May and November 2012. Figure 3 presents the ground water contours developed from data collected on 26 November 2012 and the capture zone interpreted from these contours. Figures 4 and 5 present hydrographs of the water level data for selected wells in the northern and southern plume areas, respectively.

2.1.1 *Capture Based on the Ground Water Potentiometric Surface*

Figure 3 presents the capture zone for RW-06 and RW-07, interpreted by drawing streamlines at right angles to the ground water potentiometric surface contours. The capture zone presented is consistent with previous interpretations and encompasses the entire VOC plume. Wells located along the eastern and western limits of capture have no VOCs levels above the Ground Water Cleanup Criteria (the Cleanup Criteria) specified in the Record of Decision.

2.1.2 *Capture Based on Well Pair Comparisons*

Figures 2 and Figures 6 to 13 present a comparison of the well pairs discussed in Section 1.3.2. The predicted change in water level (Δ) was determined from modeled drawdown contours, Figure 14 (Figure 3-1 in the 1996 *Performance Standards Verification Plan*). Nine well pairs are presented for the well pair comparison. Three pair are located in the northern portion of the plume (MW-04B/MW-06B, MW-13B/MW-08B, and PZ-01B/MW-11B), and six are in the southern portion (MW-24B/MW-21B, MW-24B/MW-20B, 24B/MW-23B, MW-24B/MW-18B, MW-18B/MW-19B, and MW-22B/ MW-23B). The following table summarizes the head change predicted by the system model, and the observed change:

Well Pair	Predicted Δ (ft)	Observed Δ (ft)	Comparison*
MW-24B/MW-21B	0.46	0.89	Greater
MW-04B/MW-06B	1.05	0.48	Less
MW-13B/MW-08B	0.74	0.92	Greater
PZ-01B/MW-11B	0.14	0.26	Greater
MW-24B/MW-20B	0.77	1.72	Greater
MW-24B/MW-23B	0.10	0.30	Greater
MW-24B/MW-18B	0.55	1.08	Greater
MW-18B/MW-19B	0.29	0.36	Greater
MW-22B/MW-23B	0.35	1.07	Greater

* Less, Similar, and Greater were based on an uncertainty of approximately +/- 0.10 foot in the Δ estimates, i.e. a difference between the Predicted and Observed Δ of less than 0.10 feet was considered "Similar".

Observed Δ's are reevaluated for each Performance Evaluation Report.

The Observed Δ's presented are based on the "best fit" lines presented in Figure 2, and Figures 6 to 13. The "best fit" lines were interpreted by a hydrogeologist. Where the Observed Δ is similar to or greater than the Predicted Δ, the GWRS is pumping as much or more than is required to maintain plume capture. The data points for May 2012 and November 2012 are shown as larger symbols and are labeled on the figures. The strong linear relationships observed in these graphs demonstrate that the ground water levels in the monitoring wells rise and fall in unison, as discussed in Section 1.3.2.

The well pair comparisons generate three types of results; greater than predicted change, similar to predicted change, and greater than predicted change:

1. Less than Predicted Change - A less than predicted change was observed at one well pair, MW-04B/MW-06B. The change in head at the MW-04B/MW-06B well pair has consistently been less than predicted. The difference may be related to less water being injected into the aquifer near MW-06B than simulated; potentially a higher transmissivity in the area of MW 06B; and that RW-03 is not pumping. This well pair is in the northern plume and the 'less than predicted change' is not a failure of containment. Wells RW-06, RW-07, and RW-08 along Bluff Road capture the entire plume.
2. Similar to Predicted Change - During 2012, all well pairs were either less than predicted, or greater than predicted.
3. Greater than Predicted Change - Five well pair comparisons were made in the southern area; MW-22B/MW-23B, MW-24B/MW-18B, MW-24B/MW-20B, MW-24B/MW-21B, and MW-24B/MW-23B. All

five exhibited a greater change in gradient than predicted by the modeling. This is consistent with historical conditions.

The MW-08B/MW-13B well pair in the northern area is also currently greater than predicted. This well pair has typically been 'similar' to predicted, and during 2010 and 2011, less than predicted.

In general, the results of the well pair evaluations are similar to previous years. The evaluation indicates that the system is maintaining the required hydraulic containment by pumping RW-06, RW-07, and RW-08.

2.2 *GROUND WATER QUALITY RESULTS*

Table 3 presents the results of the Annual 2012 ground water sampling for individual compounds. Table 4 presents a summary of total VOCs since the GWRS began operation. For wells sampled annually, total VOCs concentration versus time plots are presented in Attachment B. The total VOCs graphs do not include acetone or blank qualified results. While acetone has been detected sporadically, it is a common laboratory contaminant and is not considered to be a site-related VOC. Blank-qualified data are typically laboratory contaminants also. Eliminating these from the graphing makes the figures more representative of the site conditions. Concentration versus time plots for individual VOCs are included as Attachment C.

2.2.1 *Monitoring Wells*

Nineteen monitoring wells were sampled in 2012; ten of these wells had concentrations detected above Cleanup Criteria. With the exception of wells MW-10B, MW-12B, MW-23B and MW-24B, VOC levels in the site monitoring wells are declining or are below Cleanup Criteria.

- At MW-10B and MW-12B, tetrachloroethene (PCE) and trichloroethene (TCE) levels have been gradually increasing for a number of years. Concentrations appear to have peaked one or two years ago and that the trend is now declining. A similar increasing trend and subsequent decline was observed in RW-02, located generally upgradient of MW-12B. PCE concentrations at RW-02 peaked in 2009 or 2010 and have been decreasing since.

- At MW-24B, the concentrations of several VOCs have been relatively stable for the last few years. This observation suggests that there is

still a VOC plume upgradient of MW-24B that is still moving through the aquifer. As has been seen at other wells, the concentrations are expected to decline once the plume has moved past these wells.

The table below summarizes locations where the Cleanup Criteria were exceeded in 2012. The values in the table are the ratio of the maximum concentration observed in 2012 to the current Cleanup Criterion. Blank cells indicate that there were no exceedances. If a well does not appear on the table, e.g., MW20B, then there were no exceedances.

Well	11DCA	11DCE	1122TeCA	12DCE	CT	Cform	PCE	TCE
MW-02A		20.0		1.9				
MW-10B	2.0	1.6	1.6				1.8	
MW-12B	1.1		1.2	1.3			6.8	2.0
MW-13B			1.1					
MW-15B			1.2					
MW-16B	1.5		4.0					
MW-22B	3.4	2.7	2.5	1.0			1.8	1.0
MW-23B	2.4	1.3	1.1					
MW-24B		2.6	21.7		4.8	1.8	3.2	4.0
MW-25B			1.5					

Only two locations, MW-02A and MW-24B, had concentrations greater than 10 times a Cleanup Criterion.

Figure 15 presents four "plumes" (2006, 2008, 2010 and 2012) in the groundwater. The data contoured are the ratio of concentration to the cleanup ratio, exactly as presented in the table above. The area within the contour =1 exceeds cleanup criteria for one or more VOCs. The area outside of the contour =1 is below the cleanup criteria for all VOCs. These plumes were generated using Golden Software's Surfer contouring program.

2.2.2 *Recovery Wells*

VOC levels in all of the recovery wells have been declining since 2000. Table 4 summarizes total VOCs in the recovery wells since startup of the GWRS.

Seven of the eight recovery wells were sampled in 2012; well RW-03 was not sampled. Recovery well RW-03 has not been in operation since 1997 and is no longer sampled. Ground water from RW-03 contained high iron levels that interfered with effective operation of the ground water treatment system.

The table below summarizes those locations where the Cleanup Criteria were exceeded in 2012. The values in the table are the ratio of the maximum concentration observed in 2012 to the current Cleanup Criterion. Blanks indicate that there are no exceedances.

Well	11DCA	11DCE	1122TeCA	12DCE	CT	Cform	PCE	TCE
RW-02	3.0			1.2			1.3	
RW-04	3.6	2.7	4.2				1.0	1.4
RW-05	2.0	1.2	2.5					1.1
RW-06	4.0	3.4	5.2		1.3		2.2	2.2
RW-07			1.3					
RW-08			3.3		1.6			

With the exception of 1,1,2,2-tetrachloroethane (1122TeCA) in RW-06, the VOC levels in the recovery wells are below, or less than a factor of five above the Cleanup Criteria.

2.2.3 *Temporary Monitoring Piezometers*

Temporary monitoring piezometers TP-01 to TP-04, Figure 1, were installed in 1997 for the Southwest Area Investigation (SWAI) to monitor conditions downgradient of RW-06, RW-07, and RW-08. It was the intent when these wells were installed that they would be removed after one or two sampling events.

TP-01 and TP-02 were sampled in October 1997 and concentrations were below the Cleanup Criteria. Based on the ground water flow conditions in 1997, there was no reason to believe that the VOC levels in these piezometers would increase. The flow patterns today are consistent with 1997. Thus, TP-01 and TP-02 have not been sampled since October 1997.

Piezometers TP-03 and TP-04 have been sampled regularly since October 1997. TP-03 was historically downgradient of RW-08 (prior to pumping), and delineates the southern extent of VOCs along Bluff Road. Since 1997, Site-related parameters have occasionally been detected in TP-03 but always at levels below the Cleanup Criteria.

TP-04 is located southwest of Bluff Road, approximately halfway between RW-06 and RW-07, and within the hydraulic containment area of RW-06. Total VOCs at TP-04 peaked at 3,500 ug/L in April 1999 and have since dropped by over 98%. Currently only 1122TeCA exceeds its Cleanup Criterion in TP-04, . The 1122TeCA at TP-04 was 0.96 ug/L and 1.1 ug/L in May and November 2012, respectively; the Cleanup Criterion is 0.6 ug/L.

It is recommended that TP-03 and TP-04 continue to be sampled.

2.3 *OVERALL REMEDIAL PERFORMANCE*

The GWRS has been in operation since September 1996 and has contained the entire VOC plume since startup. Operation of the GWRS has significantly decreased the mass of VOCs in the Site ground water. As of 30 November 2012, approximately 928 million gallons of ground water have been removed and approximately 4,043 lbs of VOCs have been recovered and treated. Approximately 54 lbs of VOCs were recovered in 2012.

Figures 15 and 16 summarize the remedial progress. Figure 15, described previously, shows that the ground water plume is shrinking. Figure 16 presents the annual average total VOC concentrations for the monitoring wells and for the recovery wells for each year since the system began operation. The average concentration is approximately proportional to the VOC plume mass. Both the monitoring well and recovery well data show a steady and similar rate of decline in concentrations. Based on this analysis, the VOC mass in the plume has decreased by approximately 94% since startup of the GWRS.

3.0 *CONCLUSIONS AND RECOMMENDATIONS*

Operation of the GWRS has significantly improved ground water quality at the Site. The VOC mass in the plume has decreased by approximately 94% since startup of the GWRS.

Seven recovery wells were operational in 2012: RW-01, RW-02, RW-04, RW-05, RW-06, RW-07, and RW-08. Complete capture is provided by the three southern recovery wells located along Bluff Road: RW-06, RW-07, and RW-08.

The capture zone for the GWRS is similar to those presented in previous evaluations and encompasses all wells that currently exceeded the Cleanup Criteria.

The well pair evaluations support the potentiometric surface evaluation and provide a high degree of confidence that the VOC plume northeast of Bluff Road is contained by the existing GWRS.

Temporary piezometers TP-03 and TP-04 continue to provide valuable information about the VOC plume and the performance of the GWRS. TP-03 has occasional detections of site parameters but none have ever exceeded a Cleanup Criterion. TP-04 exhibits steadily declining VOC levels. It is recommended that TP-03 and TP-04 remain in the sampling program.

Tables

Table 1
Monthly Average Pumping and Injection Rates
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-1_system_flow_2012
Date Printed: 1/7/2013

	Jan 12	Feb 12	Mar 12	Apr 11	May 11	Jun 11	Jul 11	Aug 11	Sep 11	Oct 11	Nov 11	Dec 11
RW-01	8.6	9.7	9.3	15.9	9.5	6.3	4.7	9.7	5.2	8.2	4.7	6.5
RW-02	19.7	22.3	20.4	16.8	20.0	19.5	20.8	16.7	17.7	19.7	15.7	17.7
RW-03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RW-04	20.5	21.4	21.4	17.1	21.9	21.4	22.6	21.1	19.5	21.8	28.4	25.1
RW-05	21.5	23.3	22.4	30.5	24.7	21.9	26.5	21.9	19.7	23.1	28.0	25.6
RW-06	30.8	36.1	34.3	32.7	36.2	33.9	35.9	33.5	28.1	28.8	29.3	29.1
RW-07	6.0	7.8	8.4	7.8	6.6	5.3	7.6	6.6	5.1	6.4	6.7	6.6
RW-08	12.7	16.6	14.9	14.0	11.4	15.1	14.2	14.0	11.3	13.8	14.0	13.9
IW-01	9.4	11.3	9.3	12.1	9.5	8.9	11.3	8.8	9.9	9.2	9.6	9.4
IW-02	12.1	13.2	13.1	14.0	9.6	10.8	13.2	10.6	9.0	6.4	8.7	7.6
IW-03	13.7	12.1	12.0	14.9	15.2	14.3	15.2	15.0	8.8	14.6	14.9	14.8
IW-04	12.8	14.1	14.0	10.3	13.3	14.4	13.2	12.2	9.5	12.9	15.2	14.1
IW-05	12.9	13.2	13.0	13.9	15.3	14.2	12.3	14.0	12.0	13.6	14.9	14.3
IW-06	12.0	14.1	11.1	13.1	15.1	14.3	14.2	14.1	12.2	14.5	14.3	14.4
IW-07	11.9	15.0	12.2	10.0	15.4	11.7	5.6	11.0	11.0	10.0	4.0	7.0
IW-08	12.9	14.1	13.1	14.1	13.4	14.3	15.1	11.4	12.3	14.5	13.3	13.9
IW-09	11.9	12.3	11.1	13.1	14.3	12.5	12.3	14.0	12.1	13.6	14.1	13.8
IW-10	10.2	13.2	13.9	19.9	7.5	10.7	12.3	12.0	10.1	12.8	17.6	15.2

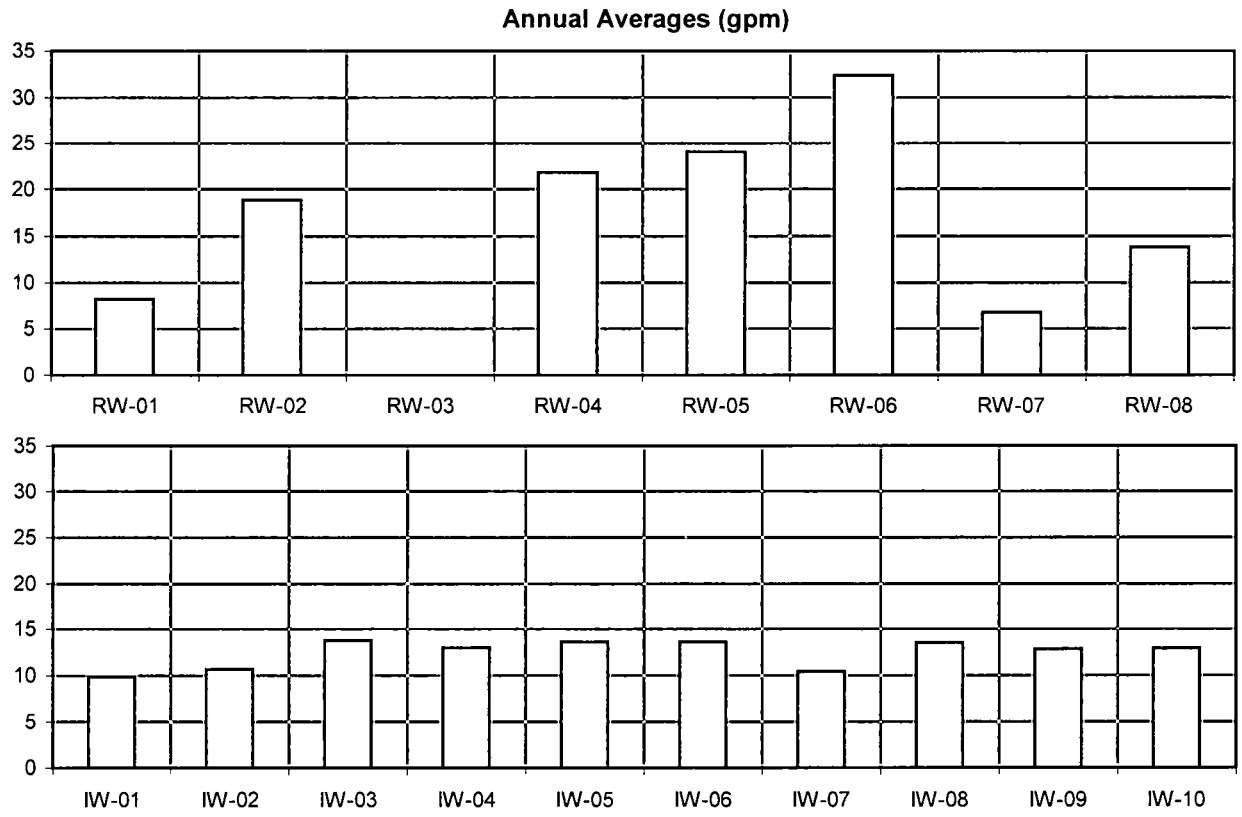

Table 2: Page 1 of 4
Ground Water Elevation Data
SCCRDI-Bluff Road Site
Columbia, South Carolina

Filename: T-2_2012
Date Printed: 1/7/2013

Well Designation	Reference Elevation (ft msl)	6 August 1996 Depth to Water (feet)	6 August 1996 Elevation (ft msl)	29 August 1996 Depth to Water (feet)	29 August 1996 Elevation (ft msl)	30 August 1996 Depth to Water (feet)	30 August 1996 Elevation (ft msl)	3 September 1996 Depth to Water (feet)	3 September 1996 Elevation (ft msl)	6 September 1996 Depth to Water (feet)	6 September 1996 Elevation (ft msl)	13 September 1996 Depth to Water (feet)	13 September 1996 Elevation (ft msl)	18 September 1996 Depth to Water (feet)	18 September 1996 Elevation (ft msl)	29 October 1996 Depth to Water (feet)	29 October 1996 Elevation (ft msl)	28 January 1997 Depth to Water (feet)	28 January 1997 Elevation (ft msl)	22 April 1997 Depth to Water (feet)	22 April 1997 Elevation (ft msl)
IW-01	140.10	11.33	128.77	10.53	129.89	10.55	2 36	11.58	128.84	9.99	130.43	11.71	128.71	8.09	132.33	5.40	134.70	1.62	138 48		
IW-02	141.89	12.77	129 12	11.60	130.61	11.57	0.01	12.98	129.23	11.89	128 54	13.10	129.11	11.10	131.11	10.24	131.65				
IW-03	140.23	11.43	128.80	10.48	130.07	10.47	1.11	11.54	129.01	10.30	130.13	11.65	128.90	9.71	130.84	8.43	131.80	0 10	140.13		
IW-04	137.10	8.53	128.57	7.57	129.85	7.64	6.24	8.64	128.78	7.57	132.83	8.73	128.69	7.11	130.31	6 99	130.11	4.78	132.32		
IW-05	139.43	11.69	127.74	8.83	130.92	8.77	5.24	11.48	128.27	9.26	131.17	11.54	128.21	8.74	131.01	8.00	131.43	4 81	134.62	3.35	136.08
IW-06	141 06	13.44	127.62	9.77	131.61	9.72	3.22	13.19	128.19	9.58	130.86	13.26	128.12	7.66	133.72	2.06	139.00				
IW-07	141.19	13.66	127.53	9.99	131.52	10.02	7.57	13.19	128 32	10.19	130.49	13.24	128.27	3.60	137.91	1.00	140.19	3.16	138.03	2.58	138.61
IW-08	141.44	14.09	127.35	3.41	138.35	2.61	15.20	13.94	127.82	2.50	137.92	13.96	127.80	9.75	132.01	10.21	131.23	3.36	138.08	2.13	139.31
IW-09	140.33	13.04	127.29	10.15	130.50	10.11	18.19	12.90	127.75	10.11	130.31	12.93	127.72	10.57	130.08	9.92	130.41	8.37	131.96	5.57	134.76
IW-10	139.90	12.59	127.31	3.77	136.45	3.55	10.95	12.43	127.79	5 83	134.62	12.44	127.78	5.88	134.34	4.62	135.28	4.28	135.62	3.60	136.30
RW-01	140.08	11.25	128.83	18.80	121.28	17.85	122.23	11.83	128.25	17.41	122.67	11.93	128.15	16.15	123.93	17.76	122.32	19.33	120.75	16.42	123.66
RW-02	141.20	13.58	127.62	15.63	125.57	15.68	125.52	13.92	127.28	15 72	125.48	13.96	127.24	15.73	125.47	15.17	126.03	13.79	127.41	13.41	127.79
RW-03	141.35	14 22	127.13	14.68	126.67	14.70	126.65	14.55	126.80	14.69	126.66	14.65	126.70	14.81	126.54	14 68	126.67	13.74	127.61	13.00	128.35
RW-04	140.53	13.68	126.85	16.18	124.35	16.33	124.20	14.12	126.41	16.34	124.19	14.14	126.39	16.56	123.97	16.39	124.14	15.34	125.19	14.65	125.88
RW-05	139.22	12.60	126.62	14.40	124.82	14.47	124.75	13.06	126.16	14.42	124.80	13.08	126.14	14.58	124.64	14.63	124.59	13.28	125.94	13.05	126.17
RW-06	138.39	17.01	121.38	28.77	109.62	28.65	109 74	17.45	120.94	28.21	110.18	17.45	120 94	28.59	109.80	27.61	110.78	26.28	112.11	25.81	112.58
RW-07	138 63	17.49	121.14	29.21	109.42	29.53	109 10	17.94	120.69	28.80	109.83	17.95	120 68	30 34	108.29	28.66	109.97	27.34	111.29	28.11	110.52
RW-08	138.84	27.98	110.86	46.30	92.54	43.28	95.56	28.34	110.50	43.62	95 22	28.36	110.48	44 25	94.59	32.19	106.65	29.62	109.22	28.89	109.95
MW-01B	143.11	14.15	128.96	14.44	128.67	14.44	128.67	14 68	128.43	14.49	128.62	14.80	128.31	14.42	128.69	14.12	128.99	12.61	130.50	11.26	131.85
MW-02B	138.53	10.66	127.87	10.88	127.65	10.86	127.67	10.97	127.56	10.94	127.59	11.03	127.50	10.87	127.66	10.52	128.01	9.62	128.91	8.69	129.84
MW-03B	137.50	9.67	127.83			10.38	127.12	10.09	127.41	10.38	127.12	10 16	127.34	10.42	127.08	10.21	127.29	9.14	128.36	8.09	129.41
MW-04B	141.03	13.91	127.12	14.00	127.03	14.01	127.02	14.23	126.80	14.04	126.99	14.26	126.77	14.21	126.82	14.04	126.99	13.14	127.89	12.56	128 47
MW-05B	141.68	14.07	127.61	12.31	129.37	12.25	129.43	14.20	127.48	12.32	129.36	14.27	127.41	11.58	130.10	10.66	131.02	10.91	130.77	10.46	131 22
MW-06B	141.75	14.47	127.28	13.88	127.87	13.89	127.86	14.69	127.06	13.97	127.78	14.73	127.02	14.17	127.58	13.96	127.79	13.22	128.53	12.66	129 09
MW-07B	140.13	12.83	127.30	12.10	128.03	12.09	128.04	13.03	127.10	12.19	127 94	13 07	127.06	12.46	127.67	12.24	127.89	11.47	128.66	10.96	129.17
MW-08B	141.34	14.22	127.12			14.02	127.32	14.43	126.91	14.06	127.28	14.46	126.88	14.27	127.07	14 11	127.23	13.22	128.12	12.75	128.59
MW-09B	137.28	10 23	127.05			10.79	126.49	10.68	126 60			10.72	126.56	10.90	126.38	10 78	126.50	9.72	127.56	8.90	128.38
MW-10B	138.59	13.04	125.55			13.79	124.80	13.42	125.17			13.42	125.17	13.92	124.67	13.93	124.66	12.92	125.67	12.50	126.09
MW-11B	139.76	13 48	126.28			13.74	126.02	13.74	126.02			13.74	126.02	13.89	125.87	13.78	125.98	12.87	126.89	12.56	127.20
MW-12B	139.67	12.76	126.91			13.42	126.25	13.20	126.47			13.23	126.44	13.53	126.14	13.47	126.20	12.48	127 19	11.75	127.92
MW-13B	140.69	14.12	126.57	14.71	125.98	14.73	125 96	14.47	126.22			14.48	126.21	14.88	125.81	14.82	125.87	13.82	126.87	13.31	127.38
MW-14B	137.71	11.56	126 15	12.09	125.62	12.11	125.60	11.91	125.80			11.91	125.80	12.24	125.47	12.21	125.50	11.23	126.48	10.80	126.91
MW-15B	137.65	14.10	123.55	14.69	122.96	14.72	122 93	14.35	123.30	14.62	123.03	14.32	123 33	14 83	122.82	14.84	122.81	13.92	123.73	13.83	123.82
MW-16B	138.20	14.95	123.25			15 58	122.62	15.20	123.00	15.47	122.73	15.16	123.04	15.69	122.51	15.73	122.47	14.79	123.41	14.76	123.44
MW-17B	136.86	13.81	123.05			14 41	122.45	14.03	122.83	14.29	122.57	13.98	122.88	14.51	122.35	14.54	122.32	13.61	123.25	13.61	123.25
MW-18B	138 55	15.95	122.60			16.64	121.91	16 18	122.37	16.52	122.03	16.15	122.40	16.76	121.79	16.83	121.72	15.88	122.67	15.85	122.70
MW-19B	138.31	15.35	122.96			15.85	122.46	15.58	122.73	15.74	122.57	15.52	122.79	15.93	122.38	15.91	122.40	15 01	123.30	15.11	123.20
MW-20B	133.92	11.70	122.22			12.15	121.77	11.87	122.05	12.04	121.88	11.83	122.09	12.24	121.68	13.20	120.72	11 33	122.59	11.42	122.50
MW-21B	134.23	12.49	121.74			13.29	120.94	12.74	121.49	13.15	121.08	12.72	121.51	13.41	120.82	13.51	120.72	12.51	121.72	12.46	121.77
MW-22B	137.33	15.68	121.65			17.81	119.52	16.10	121.23	17.63	119.70	16.09	121.24	18.04	119 29	18.37	118.96	17.36	119.97	17.12	120.21
MW-23B	138.50	15.97	122.53			17.17	121.33	16.31	122.19	17.01	121 49	16.30	122.20	17.34	121.16	17.52	120.98	16.53	121.97	16.35	122.15
MW-24B	136.68	14.91	121.77			16.39	120.29	15.26	121.42	16.23	120.45	15.26	121.42	16.59	120.09	16.80	119.88	15.77	120.91	15.62	121.06
MW-25B	138.50	17.33	121.17	19.92	118.58	20.01	118.49	17.77	120.73	19.83	118.67	17.77	120.73	20.28	118.22	20.60	117.90	19.61	118.89	19.35	119.15
BPZ-201	138.51	17.36	121.15	19.93	118.58	20.02	118.49	17.75	120.76			17.78	120.73	20.29	118.22	20.61	117.90	19.64	118 87	18 36	120.15
BPZ-202	138.60	17.48	121.12	19 93	118.67	20.02	118.58	17.89	120.71	19.84	118 76	17.89	120.71	20.28	118.32	20.60	118.00	19.61	118.99	18.37	120.23
PZ-01B	139.14	12.70	126.44			13.25	125.89	13.04	126.10			13.05	126.09	13.39	125.75	13.31	125 83	12.33	126.81	11.88	127 26
PZ-02B	139.47	13.18	126.29			13.61	125.86	13.42	126.05			13.43	126.04	13.75	125.72	13.69	125.78	12.71	126.76	12.26	127.21
TW-01	137.57	10.88	126.69					11.33	126.24					11.70	125.87	11.74	125.83	10.66	126.91	10.10	127.47
TP-01	137.27																				
TP-02	136.82																				
TP-03	137.95																				
TP-04	136.87																				

Table 2: Page 2 of 4
Ground Water Elevation Data
SCCRDI-Bluff Road Site
Columbia, South Carolina

Filename: T-2_2012
Date Printed: 1/7/2013

Well Designation	Reference Elevation (ft msl)	15 August 1997 Depth to Water (feet)	15 August 1997 Elevation (ft msl)	24 March 1998 Depth to Water (feet)	24 March 1998 Elevation (ft msl)	24 August 1998 Depth to Water (feet)	24 August 1998 Elevation (ft msl)	27 September 1999 Depth to Water (feet)	27 September 1999 Elevation (ft msl)	27 December 1999 Depth to Water (feet)	27 December 1999 Elevation (ft msl)	10 April 2000 Depth to Water (feet)	10 April 2000 Elevation (ft msl)	25 September 2000 Depth to Water (feet)	25 September 2000 Elevation (ft msl)	9 April 2001 Depth to Water (feet)	9 April 2001 Elevation (ft msl)	25 September 2001 Depth to Water (feet)	25 September 2001 Elevation (ft msl)	30 April 2003 Depth to Water (feet)	30 April 2003 Elevation (ft msl)
IW-01	140.10		140 10	0.73	139.37	1.54	138.56		140.10	4.20	135.90										
IW-02	141.89					1.99	139.90		141 89	5.50	136.39										
IW-03	140.23		140.23	1.18	139.05	2.51	137.72		140.23	2 25	137.98										
IW-04	137.10					1.98	135.12		137.10	1.41	135.69										
IW-05	139.43	3.04	136.39	1.06	138.37	7.89	131.54	8.08	131.35	5.65	133.78										
IW-06	141.06			1.69	139.37	1.78	139.28	2.40	138.66	6.32	134 74										
IW-07	141.19	3.75	137.44	1.74	139.45	9 83	131.36	4.80	136.39	8.20	132.99										
IW-08	141.44	5.20	136.24	8.11	133.33	2.15	139.29	0.00	141.44	11.12	130.32										
IW-09	140.33	9.68	130.65	1.17	139.16	11.51	128.82	4.10	136.23	11.24	129.09										
IW-10	139.90	8.83	131.07	1.33	138.57	1 34	138 56	0.82	139.08	11.43	128.47										
RW-01	140.08	16.88	123.20	10.79	129.29	14.61	125.47	11.16	128.92	9.20	130.88					17.27	122.81	11.50	128.58	16.42	123.66
RW-02	141.20	13.88	127.32	10.26	130.94	14.43	126 77	22.50	118.70	14.53	126.67					13.64	127 56	16.02	125.18	13.24	127.96
RW-03	141.35	13.45	127.90	10.52	130.83	14.27	127.08	15.07	126.28	13.82	127.53					13.38	127 97	15.50	125.85	13.14	128.21
RW-04	140.53	14.88	125.65	12.77	127.76	16.39	124.14	16.98	123.55	15.40	125.13					13.35	127.18	16.99	123.54	14.42	126.11
RW-05	139.22	13.75	125.47	10.89	128.33	14.94	124.28	14.92	124.30	14.75	124.47					15.44	123.78	19.12	120.10	13.01	126.21
RW-06	138.39	25.65	112.74	24.84	113.55	27.51	110.88	20.70	117.69	27.78	110.61					27 31	111.08	28.69	109.70	26.03	112 36
RW-07	138.63	28.73	109.90	35.91	102.72	29.28	109.35	12.72	125.91	35.05	103.58					35 83	102.80	35.92	102.71	27.99	110.64
RW-08	138.84	28.86	109.98	26.29	112.55	31.38	107.46	36.18	102.66	30.70	108.14					30.41	108.43	31.93	106.91	28.65	110.19
MW-01B	143.11	11.46	131.65	6.29	136.82	12.26	130.85	13.36	129.75	10.68	132.43	9.01	134.10	12.84	130.27	10 62	132.49	13.72	129.39	8.60	134.51
MW-02B	138.53	9.21	129.32	5.36	133.17	9.81	128.72	10.91	127.62	9.32	129.21	7.75	130.78	10.98	127.55	8.94	129.59	11.13	127.40	12.14	126 39
MW-03B	137.50	8.57	128.93	4.57	132.93	9.21	128 29	10.02	127.48	8.45	129.05	6.75	130.75	10.28	127.22	8.14	129.36	10.50	127.00	6.37	131.13
MW-04B	141.03	12.97	128.06	10.18	130.85	13.68	127.35	14.49	126.54	13.33	127.70	12 17	128.86	14.81	126.22	11 65	129.38	14.97	126.06	10.13	130.90
MW-05B	141.68	11.04	130.64	8.14	133.54	12.21	129.47	13.65	128.03	12.81	128.87	10.76	130.92	13.73	127.95	11.85	129.83	13.95	127.73	11.10	130.58
MW-06B	141.75	13.16	128.59	10.24	131.51	13.68	128 07	14.56	127.19	13.43	128.32	12.40	129.35	14.89	126.86	13.01	128.74	15.08	126 67	12.19	129.56
MW-07B	140.13	11.46	128 67	5.94	134.19	12.02	128.11			12.90	127.23	10.72	129.41	13.18	126.95	11 36	128.77	13.42	126.71	10.80	129.33
MW-08B	141.34	13.11	128.23	10.61	130.73	13.86	127.48	14.62	126.72	13.46	127.88	12.50	128.84	14.88	126.46	13.03	128.31	15.18	126 16	12.42	128 92
MW-09B	137.28	9.44	127.84	6.32	130.96	10.34	126.94	10.64	121.24	9.77	127.51	8.32	128.96	11.43	125.85	9.25	128.03	11.51	125.77	8.25	129 03
MW-10B	138.59	12.85	125.74	10.68	127.91	13.83	124.76	14.17	124.42	13.32	125.27	12.42	126.17	14.65	123.94	12.95	125 64	14.91	123.68	4.40	134.19
MW-11B	139.76	12.87	126.89	10.64	129.12	13.67	126.09	14.14	125.62	13.16	126.60	12 38	127.38	14.35	125.41	12.73	127.03	14.79	124.97	12.09	127 67
MW-12B	139.67	12.20	127.47	9.41	130.26	13.08	126 59	13.65	126.02	12.62	127.05	11.42	128.25	14.16	125.51	12.12	127.55	14.24	125.43	11.34	128.33
MW-13B	140.69	13.67	127.02	11.28	129.41	14.58	126 11			14.03	126.66	13.09	127.60	15.47	125.22	13.61	127.08	15.73	124.96	13.07	127.62
MW-14B	137.71	11.14	126.57	8.87	128.84	12.02	125.69	12.51	125.20	11.55	126.16	10 68	127.03	12.85	124 86	10.48	127.23	13.18	124.53	12.32	125.39
MW-15B	137.65	14.07	123.58	12.50	125.15	15.04	122 61	15.11	122.54	14.48	123.17	13.79	123.86	15.42	122.23	14.10	123.55	15.85	121.80	13.50	124.15
MW-16B	138.20	14.98	123.22	13.50	124.70	15.93	122.27	14.61	123.59	15.38	122.82	14 73	123.47	16.31	121 89	15.01	123.19	16.75	121.45	14.47	123.73
MW-17B	136.86	13.84	123.02	12.41	124.45	14.76	122.10	14.82	122.04	14.21	122.65	13.61	123.25	15.11	121 75	13.86	123.00	15.58	121.28	13.32	123.54
MW-18B	138.55	16.12	122.43	14.74	123 81	17.09	121.46	16.32	122.23	16.50	122.05	15.90	122.65	17.45	121.10	16.23	122.32	17.88	120.67	15.50	123.05
MW-19B	138.31	15.34	122.97	13.96	124.35	16.16	122.15	16.21	122.10	15.58	122.73	15.05	123.26	16.41	121.90	15.33	122.98	16.94	121.37	14.80	123.51
MW-20B	133.92	11.68	122.24	10.34	123.58	12.45	121.47	12.65	121.27	11.91	122.01	11.40	122.52	12.78	121.14	11.69	122.23	13.25	120.67	11.18	122.74
MW-21B	134.23	12.76	121.47	11.41	122 82	13.76	120.47	13.82	120.41	13.27	120.96	12.60	121.63	14.23	120.00	12.86	121.37	14.60	119.63	12.32	121.91
MW-22B	137.33	17.19	120.14	16.17	121.16	18.73	118.60	18 42	118 91	18.40	118.93	17.43	119.90	19.06	118.27	17.75	119.58	19.21	118.12	16.42	120.91
MW-23B	138.50	16.56	121.94	15.25	123.25	17.79	120.71	17.50	121.00	17.02	121.48	16.52	121.98	18.29	120.21	17.73	120.77	18.64	119.86	16.22	122.28
MW-24B	136.68	15.81	120.87	14.60	122.08	17.11	119.57	17.00	119.68	16.74	119.94	15.85	120 83	17.55	119.13	16.20	120.48	17.82	118.86	15.42	121.26
MW-25B	138.50	19.53	118.97	18.58	119.92	21.00	117.50	20.82	117.68	20.83	117.67	19.76	118.74	21.33	117.17	20.17	118.33	21.42	117.08	19 42	119.08
BPZ-201	138.51	19.44	119.07	18.52	119.99	20.91	117.60	20.68	117.83	20.75	117.76	19.70	118.81			20.08	118.43	21.27	117.24	19.33	119.18
BPZ-202	138.60	19.52	119.08	18.56	120.04	20.89	117.71	20.82	117.78	20.79	117.81					20.13	118.47	21.32	117.28	19 35	119.25
PZ-01B	139.14	12.23	126.91	9.86	129.28	13 14	126.00	13.63	125.51	12.63	126.51	11.70	127.44	13.99	125.15	12.15	126.99	14.28	124.86	11 66	127.48
PZ-02B	139.47	12.58	126.89	10.20	129.27	13.48	125.99	13.98	125.49	12.98	126 49	12.04	127.43	14.36	125.11			14.60	124.87	12.03	127.44
TW-01	137.57	10.50	127.07	8.01	129.56	11 49	126.08	11.96	125.61	11.02	126.55	10.00	127.57			10.59	126.98	12.65	124.92	9 89	127.68
TP-01	137.27			22.99	114.28	27.77	109.50			26.18	111.09	24.52	112.75	27.91	109.36	25.30	111.97	27.90	109.37	20 88	116.39
TP-02	136.82			22.40	114.42	27.21	109 61			25.57	111.25	24.00	112 82	27.27	109.55	24.64	112.18	27.25	109.57	21.56	115.26
TP-03	137.95			23.77	114.18	28.08	109.87			27.50	110.45	25.43	112.52	28.72	109.23	26.05	111.90	28.75	109 20	22 06	115.89
TP-04	136.87			17.86	119.01	20.51	116.36			20.15	116.72	19.13	117.74	20.85	116.02	19.45	117.42	21.03	115 84	18 16	118.71

Table 2: Page 3 of 4
Ground Water Elevation Data
SCCRDI-Bluff Road Site
Columbia, South Carolina

Filename T-2_2012
Date Printed: 1/7/2013

Well Designation	Reference Elevation (ft msl)	7 November 2003 Depth to Water (feet)	7 November 2003 Elevation (ft msl)	12 April 2004 Depth to Water (feet)	12 April 2004 Elevation (ft msl)	12 October 2004 Depth to Water (feet)	12 October 2004 Elevation (ft msl)	12 April 2005 Depth to Water (feet)	12 April 2005 Elevation (ft msl)	3 October 2005 Depth to Water (feet)	3 October 2005 Elevation (ft msl)	24 April 2006 Depth to Water (feet)	24 April 2006 Elevation (ft msl)	25 September 2006 Depth to Water (feet)	25 September 2006 Elevation (ft msl)	24 April 2007 Depth to Water (feet)	24 April 2007 Elevation (ft msl)	15 October 2007 Depth to Water (feet)	15 October 2007 Elevation (ft msl)	21 April 2008 Depth to Water (feet)	21 April 2008 Elevation (ft msl)
IW-01	140.10																				
IW-02	141.89																				
IW-03	140.23																				
IW-04	137.10																				
IW-05	139.43																				
IW-06	141.06																				
IW-07	141.19																				
IW-08	141.44																				
IW-09	140.33																				
IW-10	139.90																				
RW-01	140.08	16.50	123.58	10.18	129.90	10.52	129.56	11.56	128.52	11.41	128.67	9.13	130.95	10.29	129.79	8.12	131.96	12.45	127.63	10.04	130.04
RW-02	141.20	13.53	127.67	13.32	127.88	16.54	124.66	14.82	126.38	15.55	125.65	15.69	125.51	16.26	124.94	14.52	126.68	16.64	124.56	13.12	128.08
RW-03	141.35	13.24	128.11	11.68	129.67	15.92	125.43	11.21	130.14	15.10	126.25	14.33	127.02	15.82	125.53	13.31	128.04	15.96	125.39	11.25	130.10
RW-04	140.53	14.51	126.02	16.77	123.76	17.43	123.10	13.71	126.82	17.03	123.50	15.38	125.15	17.14	123.39	14.28	126.25	17.33	123.20	17.09	123.44
RW-05	139.22	13.24	125.98	18.50	120.72	19.78	119.44	15.55	123.67	18.94	120.28	18.84	120.38	19.46	119.76	17.72	121.50	18.67	120.55	18.71	120.51
RW-06	138.39	26.33	112.06	28.20	110.19	29.02	109.37	35.62	102.77	28.50	109.89	28.08	110.31	28.80	109.59	27.16	111.23	29.28	109.11	27.98	110.41
RW-07	138.63	28.19	110.44	27.82	110.81	36.01	102.62	26.42	112.21	34.90	103.73	34.87	103.76	35.74	102.89	33.21	105.42	35.99	102.64	27.63	111.00
RW-08	138.84	29.75	109.09	28.38	110.46	32.21	106.63	28.75	110.09	30.85	107.99	30.55	108.29	31.97	106.87	29.16	109.68	30.82	108.02	28.11	110.73
MW-01B	143.11	10.65	132.46	10.16	132.95	11.26	131.85	9.32	133.79	11.32	131.79	10.72	132.39	12.69	130.42	10.23	132.88	14.82	128.29	10.13	132.98
MW-02B	138.53	8.50	130.03	7.82	130.71	9.69	128.84	7.46	131.07	9.07	129.46	8.43	130.10	10.17	128.36	7.80	130.73	11.58	126.95	7.49	131.04
MW-03B	137.50	7.74	129.76	7.02	130.48	8.80	128.70	6.62	130.88	11.12	126.38	7.65	129.85	8.31	129.19	7.13	130.37	11.06	126.44	6.78	130.72
MW-04B	141.03	12.59	128.44	12.62	128.41	13.62	127.41	10.42	130.61	13.42	127.61	12.53	128.50	16.18	124.85	12.09	128.94	15.01	126.02	12.30	128.73
MW-05B	141.68	11.45	130.23	10.68	131.00	12.48	129.20	10.67	131.01	12.38	129.30	11.43	130.25	12.88	128.80	10.96	130.72	15.12	126.56	10.89	130.79
MW-06B	141.75	12.69	129.06	11.42	130.33	13.75	128.00	10.24	131.51	12.59	129.16	12.02	129.73	13.98	127.77	11.54	130.21	15.09	126.66	11.76	129.99
MW-07B	140.13	11.01	129.12	10.49	129.64	12.09	128.04	10.35	129.78	11.88	128.25	11.00	129.13	12.38	127.75	10.46	129.67	14.98	125.15	10.17	129.96
MW-08B	141.34	12.82	128.52	12.28	129.06	13.81	127.53	11.99	129.35	13.58	127.76	12.76	128.58	14.07	127.27	12.22	129.12	15.57	125.77	12.16	129.18
MW-09B	137.28	8.91	128.37	8.33	128.95	10.25	127.03	7.72	129.56	13.24	124.04	8.80	128.48	8.89	128.39	8.45	128.83	12.04	125.24	8.76	128.52
MW-10B	138.59	13.05	125.54	12.72	125.87	13.98	124.61	12.01	126.58	13.32	125.27	12.85	125.74	14.19	124.40	12.32	126.27	15.49	123.10	12.41	126.18
MW-11B	139.76	12.72	127.04	12.35	127.41	13.46	126.30	11.84	127.92	13.42	126.34	12.66	127.10	13.81	125.95	12.14	127.62	15.16	124.60	12.57	127.19
MW-12B	139.67	11.91	127.76	11.42	128.25	13.45	126.22	10.81	128.86	13.72	125.95	11.72	127.95	13.31	126.36	11.62	128.05	14.62	125.05	11.71	127.96
MW-13B	140.69	13.56	127.13	13.22	127.47	12.75	127.94	12.04	128.65	14.24	126.45	13.42	127.27	14.70	125.99	12.99	127.70	16.05	124.64	13.28	127.41
MW-14B	137.71	11.15	126.56	10.87	126.84	12.09	125.62	10.17	127.54	11.81	125.90	11.02	126.69	12.28	125.43	10.63	127.08	13.72	123.99	10.96	126.75
MW-15B	137.65	14.18	123.47	13.82	123.83	14.63	123.02	13.18	124.47			13.99	123.66	15.12	122.53	13.62	124.03	16.26	121.39	13.79	123.86
MW-16B	138.20	15.15	123.05	14.79	123.41	15.59	122.61	14.15	124.05	15.85	122.35	14.97	123.23	16.02	122.18	14.62	123.58	17.18	121.02	14.73	123.47
MW-17B	136.86	14.02	122.84	13.66	123.20	14.39	122.47	13.02	123.84	14.72	122.14	13.86	123.00	14.84	122.02	13.52	123.34	15.98	120.88	13.64	123.22
MW-18B	138.55	16.36	122.19	15.87	122.68	16.66	121.89	15.47	123.08	17.08	121.47	16.16	122.39	17.20	121.35	15.82	122.73	18.09	120.46	16.06	122.49
MW-19B	138.31	15.50	122.81	15.19	123.12	15.90	122.41	14.64	123.67	16.15	122.16	15.33	122.98	16.31	122.00	14.99	123.32	17.31	121.00	15.62	122.69
MW-20B	133.92	11.83	122.09	11.50	122.42	12.10	121.82	11.02	122.90	12.51	121.41	11.76	122.16	12.60	121.32	11.35	122.57	13.59	120.33	11.82	122.10
MW-21B	134.23	13.06	121.17	12.64	121.59	13.46	120.77	12.14	122.09	13.80	120.43	12.82	121.41	13.97	120.26	12.48	121.75	15.02	119.21	13.09	121.14
MW-22B	137.33	17.80	119.53	17.32	120.01	18.12	119.21	10.43	126.90	18.54	118.79	17.39	119.94	18.73	118.60	17.23	120.10	19.76	117.57	16.93	120.40
MW-23B	138.50	16.94	121.56	16.52	121.98	17.53	120.97	15.71	122.79	17.69	120.81	16.68	121.82	17.93	120.57	16.49	122.01	19.03	119.47	16.87	121.63
MW-24B	136.68	16.29	120.39	15.82	120.86	16.58	120.10	15.31	121.37	17.03	119.65	15.87	120.81	17.22	119.46	15.34	121.34	18.29	118.39	16.24	120.44
MW-25B	138.50	20.27	118.23	19.64	118.86	20.62	117.88	19.28	119.22	20.91	117.59	19.62	118.88	21.08	117.42	19.20	119.30	22.09	116.41	19.21	119.29
BPZ-201	138.51	20.08	118.43	19.55	118.96	20.51	118.00	19.20	119.31	20.72	117.79	19.53	118.98	20.94	117.57	19.09	119.42	21.89	116.62	19.24	119.27
BPZ-202	138.60	20.13	118.47	19.56	119.04	20.52	118.08	19.22	119.38	20.73	117.87	19.57	119.03	20.97	117.63	19.01	119.59	21.87	116.73	19.77	118.83
PZ-01B	139.14	12.16	126.98	11.77	127.37	13.12	126.02	11.13	128.01	12.81	126.33	12.03	127.11	13.30	125.84	11.59	127.55	14.79	124.35	11.38	127.76
PZ-02B	139.47	12.55	126.92	12.17	127.30	13.55	125.92	11.54	127.93	13.21	126.26	12.42	127.05	13.72	125.75	11.82	127.65	15.19	124.28	11.96	127.51
TW-01	137.57	10.41	127.16	9.92	127.65	11.50	126.07	9.32	128.25	11.03	126.54	11.03	126.54	11.13	126.44	9.74	127.83				
TP-01	137.27	25.95	111.32	25.12	112.15	24.67	112.60	24.01	113.26	26.42	110.85	25.62	111.65	26.99	110.28	24.91	112.36	28.61	108.66	25.42	111.85
TP-02	136.82	25.26	111.56	24.54	112.28	24.13	112.69	23.34	113.48	26.63	110.19	24.98	111.84	26.32	110.50	22.61	114.21	28.11	108.71	24.87	111.95
TP-03	137.95	26.40	111.55	26.03	111.92	25.33	112.62	24.72	113.23	27.21	110.74	26.42	111.53	27.73	110.22	25.67	112.28	28.62	109.33	26.44	111.51
TP-04	136.87	19.33	117.54	18.98	117.89	19.50	117.37	17.99	118.88	20.13	116.74	19.00	117.87	20.39	116.48	18.84	118.03	20.48	116.39	19.07	117.80

Table 2: Page 4 of 4
Ground Water Elevation Data
SCCRDI-Bluff Road Site
Columbia, South Carolina

Filename: T-2_2012
Date Printed: 1/7/2013

Well Designation	Reference Elevation (ft msl)	24 October 2008 Depth to Water (feet)	24 October 2008 Elevation (ft msl)	22 May 2009 Depth to Water (feet)	22 May 2009 Elevation (ft msl)	14 December 2009 Depth to Water (feet)	14 December 2009 Elevation (ft msl)	5 May 2010 Depth to Water (feet)	5 May 2010 Elevation (ft msl)	15 November 2010 Depth to Water (feet)	15 November 2010 Elevation (ft msl)	30 May 2011 Depth to Water (feet)	30 May 2011 Elevation (ft msl)	20 November 2011 Depth to Water (feet)	20 November 2011 Elevation (ft msl)	May 2012 Depth to Water (feet)	May 2012 Elevation (ft msl)	26 November 2012 Depth to Water (feet)	26 November 2012 Elevation (ft msl)
IW-01	140.10																		
IW-02	141.89																		
IW-03	140.23																		
IW-04	137.10																		
IW-05	139.43																		
IW-06	141.06																		
IW-07	141.19																		
IW-08	141.44																		
IW-09	140.33																		
IW-10	139 90																		
RW-01	140.08	10.42	129.66	8.57	131.51	8.99	131.09	17 84	122.24	12.42	127.66	14.79	125.29	16.65	123.43	12 11	127.97	13.62	126.46
RW-02	141 20	13.59	127.61	13.25	127 95	11.85	129.35	15.29	125.91	15 75	125.45	11.91	129.29	13.69	127.51	15.22	125.98	15.85	125.35
RW-03	141.35	11.95	129.40	11.93	129.42	11.32	130.03	14.55	126.80	14 31	127.04	11.25	130.10	13.38	127.97	14.80	126.55	15.13	126.22
RW-04	140.53	17.02	123.51	14.96	125.57	13.60	126.93	16 48	124.05	16.43	124.10	13.77	126.76	14.61	125.92	18 99	121.54	16.27	124.26
RW-05	139.22	18 81	120.41	15 98	123 24	15.90	123.32	14.76	124.46	16 50	122.72	15.64	123.58	13.33	125.89	19.11	120.11	19.18	120.04
RW-06	138.39	28.95	109.44	27.95	110.44	28.29	110.10	27 79	110 60	27.62	110.77	35.69	102.70	26.45	111.94	29 07	109.32	28.18	110.21
RW-07	138.63	28.33	110.30	29.32	109.31	27.98	110.65	28 80	109.83	30.24	108.39	26.69	111.94	28.34	110.29	35 95	102.68	35.92	102.71
RW-08	138.84	28.91	109.93	28.21	110.63	27.01	111.83	32.31	106.53	33 21	105.63	28.86	109.98	29.95	108.89	30.75	108.09	30.64	108.20
MW-01B	143.11	11.26	131.85	10.56	132.55	8.37	134.74	14 24	128.87	16.20	126.91	9.38	133.73	10.99	132.12	12 68	130.43	11.27	131.84
MW-02B	138.53	8.66	129.87	8.06	130.47	9.48	129.05	10 65	127.88	11.79	126.74	7.50	131.03	8.63	129.90	10.54	127.99	11.09	127.44
MW-03B	137.50	8.14	129.36	7.37	130.13	5.73	131.77	10.33	127.17	9.92	127.58	6.67	130.83	7 89	129.61	9.73	127.77	10.43	127.07
MW-04B	141.03	13.85	127.18	12.23	128.80	11.22	129.81	14.23	126.80	14.11	126.92	10.40	130 63	12.73	128.30	14.34	126.69	14.72	126.31
MW-05B	141.68	9.74	131.94	11.27	130.41	10.23	131.45	10.79	130.89	14.76	126 92	10.75	130.93	11.54	130.14	13.59	128.09	13.96	127 72
MW-06B	141.75	12.57	129.18	12.36	129.39	11.40	130.35	14.07	127.68	14.83	126 92	10.29	131.46	12.84	128.91	14.48	127.27	14.77	126 98
MW-07B	140.13	9.25	130.88	10.71	129.42	9.79	130.34	12 33	127.80	13.21	126.92	10.44	129 69	11.13	129.00	12.80	127.33	13.06	127.07
MW-08B	141.34	13.71	127.63	12.47	128.87	11.52	129.82	14.22	127.12	14.42	126.92	12.05	129.29	12.96	128.38	14.47	126.87	14.78	126.56
MW-09B	137.28	9.44	127.84	8.60	128.68	9.38	127.90	10.89	126.39	10.89	126.39	7.74	129.54	9.00	128.28	10.85	126.43	11.20	126.08
MW-10B	138.59	13.64	124.95	12.75	125.84	11.75	126.84	14.05	124.54	14.44	124.15	12.10	126 49	13.17	125.42	14.65	123.94	14.99	123.60
MW-11B	139.76	13.16	126.60	12.43	127.33	11.42	128.34	13.87	125.89	13.95	125.81	11.91	127.85	12.83	126.93	14.15	125.61	14.46	125.30
MW-12B	139.67	12.65	127.02	11.48	128.19	10.38	129.29	13.59	126.08	13.62	126.05	10.87	128.80	12.06	127.61	13.70	125.97	14.15	125.52
MW-13B	140 69	12.49	128.20	13.22	127.47	12.12	128.57	14.94	125.75	14.89	125.80	12.15	128 54	13.70	126.99	15.28	125.41	15.67	125.02
MW-14B	137.71	10.25	127.46	10.98	126.73	9.93	127.78	12.34	125.37	11.90	125.81	10.23	127.48	11.28	126.43	12.88	124.83	13.18	124.53
MW-15B	137.65	13.40	124.25	13.83	123.82	12.92	124.73	14.96	122.69	14.95	122.70	13.29	124.36	14.30	123.35	15.23	122.42	15.36	122.29
MW-16B	138.20	15.11	123.09	14.81	123.39	13.88	124.32	15.85	122.35	15.77	122.43	14.21	123.99	15.29	122.91	16.12	122.08	16.23	121.97
MW-17B	136.86	13.89	122.97	13.68	123.18	12.72	124.14	14.68	122.18	14.56	122.30	13.12	123.74	14.19	122.67	14.94	121.92	15.03	121.83
MW-18B	138.55	16.51	122.04	16.01	122.54	15.07	123.48	16.95	121.60	16.82	121.73	15.60	122 95	16.49	122.06	17.27	121.28	17.33	121.22
MW-19B	138.31	15.61	122.70	15.17	123.14	14.27	124.04	16.02	122.29	15.86	122 45	14.73	123.58	15.63	122.68	16.28	122.03	16.32	121.99
MW-20B	133.92	12.03	121.89	11.55	122.37	10.62	123.30	13.31	120.61	12.18	121.74	11.09	122.83	11.95	121.97	12.45	121.47	12.64	121.28
MW-21B	134.23	13.46	120.77	12.72	121.51	11.70	122.53	13.62	120.61	12.50	121.73	12.20	122.03	12.43	121.80	13.99	120.24	14.09	120.14
MW-22B	137 33	18.09	119.24	17.42	119.91	16.36	120.97	18.49	118.84	18.55	118.78	16.48	120.85	17.93	119.40	18.90	118.43	18.99	118 34
MW-23B	138.50	17.17	121.33	16.54	121.96	15.57	122.93	17 64	120.86	17.66	120.84	15.75	122.75	17.09	121.41	18.01	120.49	18.12	120.38
MW-24B	136.68	16.25	120.43	15.86	120.82	14.79	121.89	16.93	119.75	16.98	119 70	15.43	121.25	16.42	120.26	17.12	119 56	17.42	119.26
MW-25B	138 50	19.96	118.54	19.81	118.69	18.43	120.07	20.71	117.79	20.90	117.60	19.37	119 13	20.39	118.11	21.29	117.21	21.34	117.16
BPZ-201	138.51	20.13	118.38	19.65	118.86	18.41	120.10	20.72	117.79	20.93	117.58	19.27	119.24	20.24	118.27	21.03	117.48	21.10	117.41
BPZ-202	138 60	20.01	118.59	19.67	118.93	18.35	120.25	20.70	117.90	20 97	117.63	18.91	119 69	20.25	118.35	21.06	117.54	21.13	117 47
PZ-01B	139 14	12 40	126.74	11.83	127.31	10.71	128.43	13.43	125.71	13.32	125.82	11.22	127.92	12.27	126.87	13.80	125.34	14.15	124 99
PZ-02B	139.47	12.81	126.66	12.23	127.24	11.16	128 31	13.81	125.66	13.68	125.79	11.65	127.82	12.65	126.82	14.18	125.29	14.53	124.94
TW-01	137 57																		
TP-01	137.27	25.96	111 31	24 98	112 29	21.89	115.38	26 55	110.72	26.66	110.61	24.09	113.18	26.09	111.18	25.90	111.37	27.42	109.85
TP-02	136.82	25.17	111.65	24.42	112.40	22.55	114.27	26.75	110.07	26.86	109 96	23.40	113.42	25.38	111.44	26.49	110.33	26.81	110.01
TP-03	137 95	26 78	111.17	25.54	112 41	10.41	127.54	20.24	117.71	20.36	117.59	24.81	113 14	26.51	111.44	27.35	110 60	28.34	109.61
TP-04	136.87	19 82	117.05	18.61	118.26	17.62	119.25	27.34	109.53	27.45	109.42	18.07	118.80	19.53	117.34	20.45	116 42	20.63	116.24

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Filename: T-3_2012
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Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Compound	Criteria (ug/L)	MW-02A (ug/L)		MW-03B (ug/L)		MW-08B (ug/L)		MW-09B (ug/L)		MW-10B (ug/L)		MW-11B (ug/L)		MW-12B (ug/L)		MW-13B (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Benzene	5	2.7		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Carbon Tetrachloride	5	BQL		BQL		BQL		BQL		0.14	J	BQL		0.33	J	2.7	
Chlorobenzene	100	BQL		BQL		BQL		BQL		0.3	J	BQL		BQL		BQL	
Chloroform	20.9	BQL		0.25	J	0.52		BQL		1.5		BQL		0.93		21	
1,1 Dichloroethane	5	5.1		BQL		0.11	J	BQL		17		BQL		3.4		9.6	
1,2 Dichloroethane	5	6.2		BQL		BQL		BQL		3.8		BQL		BQL		1.3	
1,1 Dichloroethene	7	26		BQL		BQL		BQL		29		BQL		2.4		8.4	
1,2 Dichloroethene	70	44		BQL		0.18	J	BQL		100		BQL		68		16	
1,2 Dichloropropane	5	BQL		BQL		BQL		BQL		0.14	J	BQL		BQL		0.12	J
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Methylene Chloride	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	BQL		BQL		0.33	J	BQL		1.1		BQL		0.58		1.5	
Tetrachloroethene	5	BQL		BQL		BQL		BQL		7.8		BQL		25		2.8	
Toluene	1000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,1 Trichloroethane	200	BQL		BQL		BQL		BQL		0.5		BQL		0.68		0.16	J
1,1,2 Trichloroethane	2.2	0.2	J	BQL		BQL		BQL		0.32	J	BQL		BQL		0.52	
Trichloroethene	5	0.56		BQL		BQL		BQL		3.8		BQL		6.7		3.4	
Xylene (total)	10000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
2-Butanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
TOTAL VOCs*		**85**		**0.25**		**1.1**		**0**		**165**		**0**		**108**		**68**	

Notes

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Table 3: Page 2 of 4
Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-3_2012
Date Printed: 1/7/2013

Compound	Criteria (ug/L)	MW-15B (ug/L)		MW-16B (ug/L)		MW-17B (ug/L)		MW-18B (ug/L)		MW-19B (ug/L)		MW-20B (ug/L)		MW-21B (ug/L)		MW-22B (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Benzene	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Carbon Tetrachloride	5	0.83		1.6		BQL		BQL		BQL		BQL		BQL		0.97	
Chlorobenzene	100	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Chloroform	20.9	6		8.8		0.24	J	BQL		BQL		BQL		BQL		5	
1,1 Dichloroethane	5	1.8		2.1		BQL		BQL		BQL		BQL		BQL		15	
1,2 Dichloroethane	5	0.35	J	BQL		BQL		BQL		BQL		BQL		BQL		2.7	
1,1 Dichloroethene	7	2.2		2.3		BQL		BQL		BQL		BQL		BQL		18	
1,2 Dichloroethene	70	2.9		2.4		BQL		BQL		BQL		BQL		BQL		59	
1,2 Dichloropropane	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		0.17	J
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
Methylene Chloride	5	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	1		1		BQL		BQL		BQL		BQL		BQL		1.3	
Tetrachloroethene	5	1.3		1.3		BQL		BQL		BQL		BQL		BQL		5.1	
Toluene	1000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
1,1,1 Trichloroethane	200	BQL		BQL		BQL		BQL		BQL		BQL		BQL		0.29	J
1,1,2 Trichloroethane	2.2	0.24	J	BQL		BQL		BQL		BQL		BQL		BQL		0.2	J
Trichloroethene	5	1.1		1.5		BQL		BQL		BQL		BQL		BQL		4.3	
Xylene (total)	10000	BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
2-Butanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL		BQL		BQL		BQL	
TOTAL VOCs*		**18**		**21**		**0**		**0**		**0**		**0**		**0**		**112**	

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Table 3: Page 3 of 4

Filename: T-3_2012
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Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Compound	Criteria (ug/L)	MW-23B (ug/L)		MW-24B (ug/L)		MW-25B (ug/L)		RW-01 (ug/L)		RW-02 (ug/L)		RW-03 (ug/L)	RW-04 (ug/L)		RW-05 (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
Benzene	5	BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
Carbon Tetrachloride	5	BQL		18		1		BQL		0.3	J	NS	4.1		2.1	
Chlorobenzene	100	BQL		BQL		BQL		BQL		2.1		NS	BQL		BQL	
Chloroform	20.9	0.58		150		5.4		BQL		1.6		NS	39		19	
1,1 Dichloroethane	5	9.5		3.5		0.25	J	BQL		31		NS	19		9.9	
1,2 Dichloroethane	5	1.6		1.6		BQL		BQL		0.27	J	NS	1.1		1	
1,1 Dichloroethene	7	6.1		17		1		BQL		6.1		NS	18		9	
1,2 Dichloroethene	70	10.3		5.2		0.32	J	BQL		33		NS	29		17	
1,2 Dichloropropane	5	0.11	J	0.39	J	BQL		BQL		BQL		NS	0.22	J	0.14	J
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
Methylene Chloride	5	BQL		0.2	J	BQL		BQL		BQL		NS	BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	0.63		13		0.42	J	BQL		0.5		NS	2.6		1.7	
Tetrachloroethene	5	2.7		17		0.83		0.21	J	1.6		NS	5.1		3.3	
Toluene	1000	BQL		BQL		BQL		BQL		0.17	J	NS	BQL		BQL	
1,1,1 Trichloroethane	200	BQL		1		BQL		BQL		3.5		NS	0.24	J	0.17	J
1,1,2 Trichloroethane	2.2	BQL		0.37	J	BQL		BQL		0.28	J	NS	0.19	J	0.34	J
Trichloroethene	5	2.1		21		0.88		BQL		1.3		NS	6.5		4.9	
Xylene (total)	10000	BQL		BQL		BQL		BQL		0.53		NS	BQL		BQL	
2-Butanone		BQL		BQL		BQL		BQL		3.4	J	NS	3.1	J	2.4	J
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL		NS	BQL		BQL	
TOTAL VOCs*		**34**		**248**		**10**		**0.21**		**86**		**NS**	**128**		**71**	

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Table 3: Page 4 of 4
Annual Ground Water Quality Summary: November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-3_2012
Date Printed: 1/7/2013

Compound	Criteria (ug/L)	RW-06 (ug/L)		RW-07 (ug/L)		RW-08 (ug/L)		TP-03 (ug/L)		TP-04 (ug/L)	
Acetone	1100	BQL		BQL		BQL		BQL		BQL	
Benzene	5	BQL		BQL		BQL		BQL		BQL	
Carbon Tetrachloride	5	7.1		3		6.7		BQL		3.4	
Chlorobenzene	100	BQL		BQL		BQL		BQL		BQL	
Chloroform	20.9	47		11		13		BQL		18	
1,1 Dichloroethane	5	20		0.42	J	0.25	J	BQL		0.64	
1,2 Dichloroethane	5	2.9		0.27	J	0.37	J	BQL		0.34	J
1,1 Dichloroethene	7	25		2.3		2.8		BQL		2.9	
1,2 Dichloroethene	70	53		0.59		0.4	J	BQL		0.78	
1,2 Dichloropropane	5	0.29	J	BQL		BQL		BQL		BQL	
Ethylbenzene	700	BQL		BQL		BQL		BQL		BQL	
Methylene Chloride	5	0.20	J	BQL		BQL		BQL		BQL	
1,1,2,2 Tetrachloroethane	0.6	3.7		0.9		1.9		BQL		1.1	
Tetrachloroethene	5	10		1.9		2.7		BQL		2.3	
Toluene	1000	BQL		BQL		BQL		BQL		BQL	
1,1,1 Trichloroethane	200	0.56		0.1	J	BQL		BQL		0.16	J
1,1,2 Trichloroethane	2.2	0.38	J	BQL		BQL		BQL		BQL	
Trichloroethene	5	11		1.9		2.5		BQL		2.7	
Xylene (total)	10000	BQL		BQL		BQL		BQL		BQL	
2-Butanone		6	J	BQL		BQL		BQL		BQL	
4-Methyl-2-Pentanone		BQL		BQL		BQL		BQL		BQL	
TOTAL VOCs*		**187**		**22**		**31**		**0**		**32**	

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Table 4: Page 1 of 3
Historical Total Volatile Organic Compounds*
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-4_2012
Date Printed: 1/7/2013

Monitoring Well	Baseline Event Jun 96	1st Quarter Oct 96	2nd Quarter Jan 97	3rd Quarter Apr 97	Annual Event Aug 97	Semi Annual Event Mar 98	Annual Event Aug 98	Semi Annual Event Apr 99	Annual Event Sep 99	Semi Annual Event Apr 00	Annual Event Sep 00	Semi Annual Event Apr 01
MW-02A	6340	-	-	-	2262	-	2008	-	566	-	461	-
MW-03B	BQL	-	-	-	BQL	-	2	-	BQL	-	0.6	-
MW-08B	1	BQL	BQL	BQL	BQL	BQL	2	2	1	1	5	2
MW-09B	BQL	-	-	-	BQL	-	3	-	BQL	-	0.2	-
MW-10B	95	69	93	64	168	97	115	70	82	112	137	242
MW-11B	BQL	8	BQL	BQL	BQL	BQL	4	1	BQL	BQL	5	BQL
MW-12B	38	32	31	33	57	31	30	65	66	35	44	82
MW-13B	3040	-	-	-	1087	-	1112	-	669	-	610	-
MW-15B	943	-	-	-	748	-	1143	-	770	-	233	-
MW-16B	228	-	-	-	1002	-	625	-	310	-	162	-
MW-17B	39	-	-	-	1	-	6	-	4	-	* 4	-
MW-18B	48	-	-	-	10	-	5	-	0.3	-	0.2	-
MW-19B	BQL	BQL	BQL	BQL	BQL	BQL	5	1	BQL	0.2	0.1	0.1
MW-20B	BQL	BQL	BQL	BQL	BQL	BQL	2	1	BQL	5	0.2	5
MW-21B	31	10	24	9	5	19	18	14	13	16	12	7
MW-22B	26	19	137	688	823	1170	1179	1269	986	813	512	569
MW-23B	2887	-	-	-	1440	-	182	-	138	-	534	-
MW-24B	1	-	-	-	BQL	-	6	-	45	-	48	-
MW-25B	3703	-	-	-	2430	-	2018	-	784	-	333	-
MW-03C	-	-	-	-	BQL	-	-	-	-	-	-	-
MW-04C	-	-	-	-	BQL	-	-	-	-	-	-	-
MW-09C	-	-	-	-	BQL	-	-	-	-	-	-	-

Southwest Area					SWAI Oct 97	SWAI Mar 98	SWAI Aug 98	SWAI Apr 99	SWAI Sep 99	SWAI Apr 00	SWAI Sep 00	SWAI Apr 01
TP-01	-	-	-	-	BQL	-	-	-	-	-	-	-
TP-02	-	-	-	-	1.7	-	-	-	-	-	-	-
TP-03	-	-	-	-	2.2	BQL	2	BQL	5	BQL	0.2	0.6
TP-04	-	-	-	-	1967	2052	1576	3493	3111	1603	1778	658

Recovery Well	Before Start-up 8/8/1996	After Start-up 8/26/1996	Semi Annual Event 1/1/1997	Annual Event Aug 97	Semi Annual Event Mar 98	Annual Event Aug 98	Semi Annual Event Apr 99	Annual Event Sep 99	Semi Annual Event Apr 00	Annual Event Sep 00	Semi Annual Event Apr 01
RW-01	BQL	1	93	BQL	BQL	10	2	1	1	1	1
RW-02	38	288	623	194	404	603	-	605	542	390	256
RW-03	2449	-	-	-	-	-	-	-	-	-	-
RW-04	955	1562	1501	1145	1047	1136	1388	1066	832	735	569
RW-05	2920	3753	2283	1611	2062	2121	1897	1373	1191	954	608
RW-06	198	547	1236	1798	1995	1924	2800	3053	1899	1941	1259
RW-07	1460	3321	1596	1678	1604	1491	1222	886	709	556	478
RW-08	728	935	484	1006	1238	566	778	556	640	460	366

Notes :

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Table 4: Page 2 of 3
Historical Total Volatile Organic Compounds*
SCRDI - Bluff Road Site
Columbia, South Carolina

Filename: T-4_2012
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Monitoring Well	Annual Event Sep 01	Semi Annual Event May 02	Annual Event Oct 02	Semi Annual Event Apr 03	Annual Event Oct 03	Semi Annual Event Apr 04	Annual Event Oct 04	Semi Annual Event Apr 05	Annual Event Oct 05	Semi Annual Event Apr 06	Annual Event Sep 06	Semi Annual Event Apr 07
MW-02A	469	-	447	-	932	-	135	-	495	-	120	-
MW-03B	1.1	-	1.1	-	0.9	-	0.5	-	0.5	-	0.7	-
MW-08B	4	1	2	1	3	14	1	0.2	0.2	2.4	1.7	BQL
MW-09B	0.2	-	0.1	-	0.8	-	BQL	-	BQL	-	0.3	-
MW-10B	452	476	454	583	603	280	255	251	223	360	237	198
MW-11B	0.2	0.2	0.1	BQL	BQL	20	0.2	BQL	BQL	0.4	0.5	BQL
MW-12B	89	120	109	90	103	102	96	139	103	178	118	115
MW-13B	202	-	89	-	73	-	72	-	56	-	46	-
MW-15B	85	-	75	-	56	-	32	-	37	-	33	-
MW-16B	337	-	172	-	130	-	47	-	168	-	125	-
MW-17B	2.8	-	3.3	-	4	-	1	-	0.6	-	0.7	-
MW-18B	1	-	0.4	-	0.4	-	0.1	-	BQL	-	0.3	-
MW-19B	0.1	0.6	0.1	0.1	BQL	12	BQL	0.1	BQL	1.1	0.5	1
MW-20B	0.4	0.3	0.1	0.5	BQL	13	0.2	BQL	BQL	2	0.5	BQL
MW-21B	4.1	2	1.5	1.8	2	12.0	1.1	0.3	BQL	0.6	0.9	BQL
MW-22B	428	439	372	423	495	566	470	417	374	604	267	282
MW-23B	95	-	70	-	75	-	57	-	84	-	84	-
MW-24B	398	-	669	-	402	-	348	-	292	-	305	-
MW-25B	96	-	96	-	70	-	33	-	32	-	39	-
MW-03C	-	-	-	-	-	-	-	-	-	-	-	-
MW-04C	-	-	-	-	-	-	-	-	-	-	-	-
MW-09C	-	-	-	-	-	-	-	-	-	-	-	-

Southwest Area	SWAI Sep 01	SWAI May 02	SWAI Oct 02	SWAI Apr 03	SWAI Oct 03	SWAI Apr 04	SWAI Oct 04	SWAI Apr 05	SWAI Oct 05	SWAI Apr 06	SWAI Sep 06	SWAI Apr 07
TP-01	-	-	-	-	-	-	-	-	-	-	-	-
TP-02	-	-	-	-	-	-	-	-	-	-	-	-
TP-03	0.2	0.4	0.3	0.2	BQL	19	BQL	0.2	BQL	2.2	0.4	1.4
TP-04	520	355	399	270	168	106	143	131	126	77	119	58

Recovery Well	Annual Event Sep 01	Semi Annual Event May 02	Annual Event Oct 02	Semi Annual Event Apr 03	Annual Event Oct 03	Semi Annual Event Apr 04	Annual Event Oct 04	Semi Annual Event Apr 05	Annual Event Oct 05	Semi Annual Event Apr 06	Annual Event Oct 06	Semi Annual Event Apr 07
RW-01	BQL	2	0.3	0.1	BQL	9	0.4	BQL	-	7	2	-
RW-02	280	161	197	224	331	190	114	96	138	129	151	137
RW-03	-	-	-	-	-	-	-	-	-	-	-	-
RW-04	521	362	386	379	306	231	188	215	182	236	217	155
RW-05	580	367	304	356	236	178	125	182	167	168	157	112
RW-06	1012	852	869	667	741	635	465	448	472	643	507	395
RW-07	294	264	245	192	170	142	93	124	91	130	115	62
RW-08	385	231	239	223	157	126	75	71	74	104	87	52

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Table 4: Page 3 of 3
Historical Total Volatile Organic Compounds*
SCRDI - Bluff Road Site
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Filename: T-4_2012
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Monitoring Well	Annual Event Oct 07	Semi Annual Event Apr 08	Annual Event Oct 08	Semi Annual Event May 09	Annual Event Dec 09	Semi Annual Event May 10	Annual Event Nov 10	Semi Annual Event May 11	Annual Event Nov 11	Semi Annual Event May 12	Annual Event Nov 12
MW-02A	92	-	758	-	648	-	343	-	85	-	270
MW-03B	0.3	-	BQL	-	0.2	-	0.3	-	0.3	-	BQL
MW-08B	1.2	1	1	1	1.4	17	1	2	1.1	0.4	0.8
MW-09B	BQL	-	BQL	-	BQL	-	0.1	-	BQL	-	BQL
MW-10B	192	173	169	167	189	170	218	199	165	122	81
MW-11B	0.6	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
MW-12B	118	88	98	124	84	139	115	179	108	147	106
MW-13B	51	-	23	-	30	-	31	-	67	-	18
MW-15B	29	-	23	-	23	-	28	-	18	-	13
MW-16B	64	-	44	-	BQL	-	35	-	21	-	53
MW-17B	2	-	BQL	-	BQL	-	BQL	-	BQL	-	BQL
MW-18B	0.5	-	0.7	-	BQL	-	BQL	-	BQL	-	BQL
MW-19B	BQL	BQL	0.2	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
MW-20B	1.7	0.5	BQL	BQL	BQL	16	BQL	BQL	BQL	BQL	BQL
MW-21B	BQL	0.5	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
MW-22B	230	201	166	181	166	172	162	148	112	133	85
MW-23B	193	-	65	-	0.3	-	55	-	34	-	45
MW-24B	103	-	256	-	BQL	-	286	-	248	-	242
MW-25B	22	-	21	-	BQL	-	17	-	10	-	23
MW-03C	-	-	-	-	-	-	-	-	-	-	-
MW-04C	-	-	-	-	-	-	-	-	-	-	-
MW-09C	-	-	-	-	-	-	-	-	-	-	-

Southwest Area	SWAI Oct 07	SWAI Apr 08	SWAI Oct 08	SWAI May 09	SWAI Dec 09	SWAI May 10	SWAI Nov 10	SWAI May 11	SWAI Nov 11	SWAI May 12	SWAI Nov 12
TP-01	-	-	-	-	-	-	-	-	-	-	-
TP-02	-	-	-	-	-	-	-	-	-	-	-
TP-03	BQL	BQL	BQL	NS	BQL	BQL	BQL	4	BQL	BQL	BQL
TP-04	51	37	34	35	25	31	39	27	32	23	31

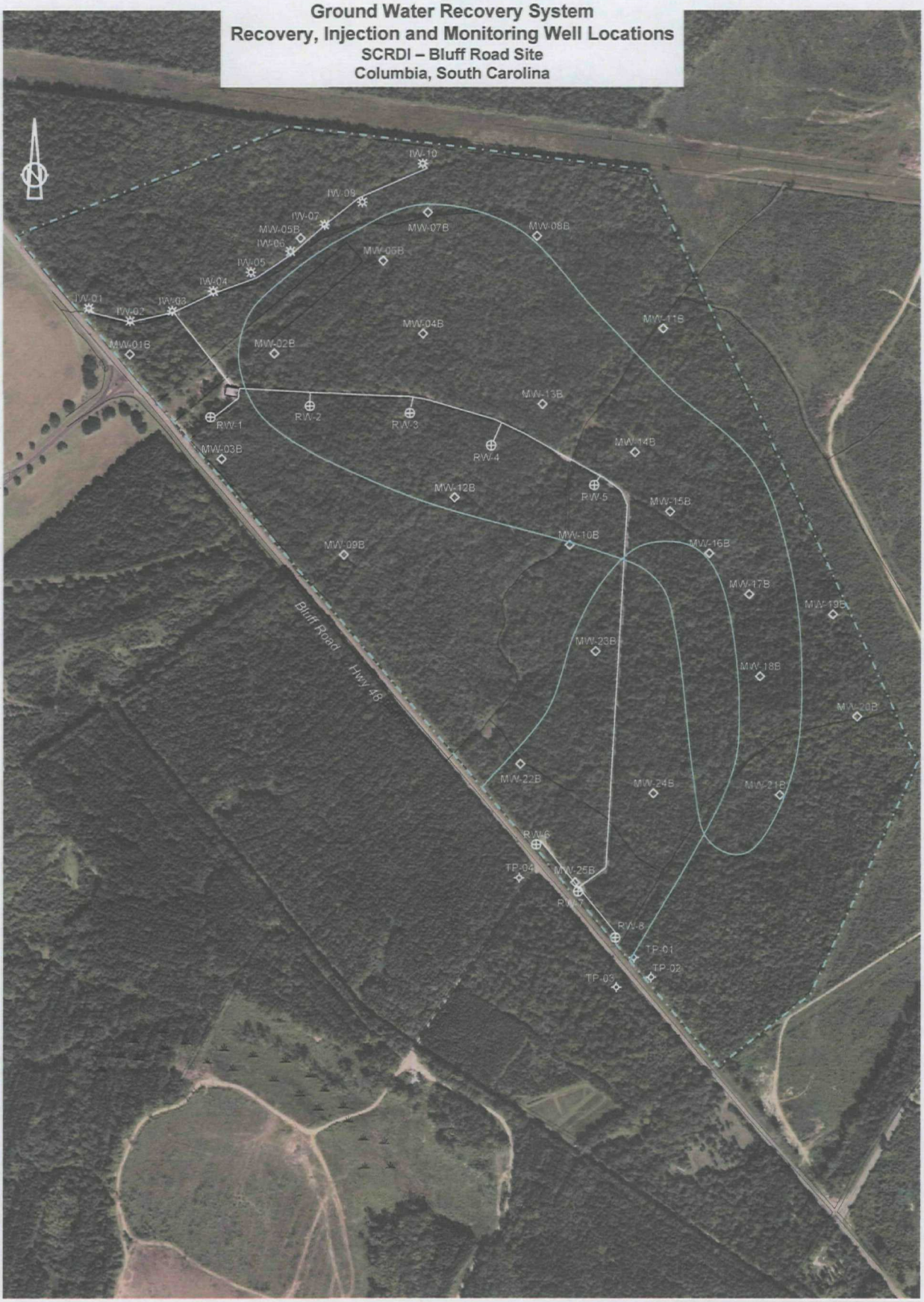
Recovery Well	Annual Event Oct 07	Semi Annual Event Apr 08	Annual Event Oct 08	Semi Annual Event May 09	Annual Event Dec 09	Semi Annual Event May 10	Annual Event Nov 10	Semi Annual Event May 11	Annual Event Nov 11	Semi Annual Event May 12	Annual Event Nov 12
RW-01	-	-	-	0.2	0.2	16	6	BQL	0.2	9	0.9
RW-02	109	97	71	81	90	101	124	39	86	119	112
RW-03	-	-	-	-	-	-	-	-	-	-	-
RW-04	144	137	145	118	122	114	166	133	128	117	91
RW-05	122	98	98	89	72	69	58	76	71	65	58
RW-06	347	300	290	242	222	229	170	198	187	180	172
RW-07	56	46	43	36	29	26	19	28	22	20	21
RW-08	46	39	43	58	60	37	38	6	31	33	38

Notes :

All results reported as ug/L
BQL = Below Quantitation Limit
* - Total VOCs is the sum of all values, including B- and J-qualified results.

Figures

Figure 1
Ground Water Recovery System
Recovery, Injection and Monitoring Well Locations
SCRDI – Bluff Road Site
Columbia, South Carolina



0 500 1,000

Scale in Feet

Legend

⊕ RW-3	Recovery Well
✲ IW-03	Injection Well
◇ MW-22B	Monitoring Well
◇ TP-03	Temporary Piezometer
	Delivery Lines and Access Roads
	Acquisition Area
	Isoline for Ground Water at Target Cleanup Levels (ERM 1996)

Figure 2
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

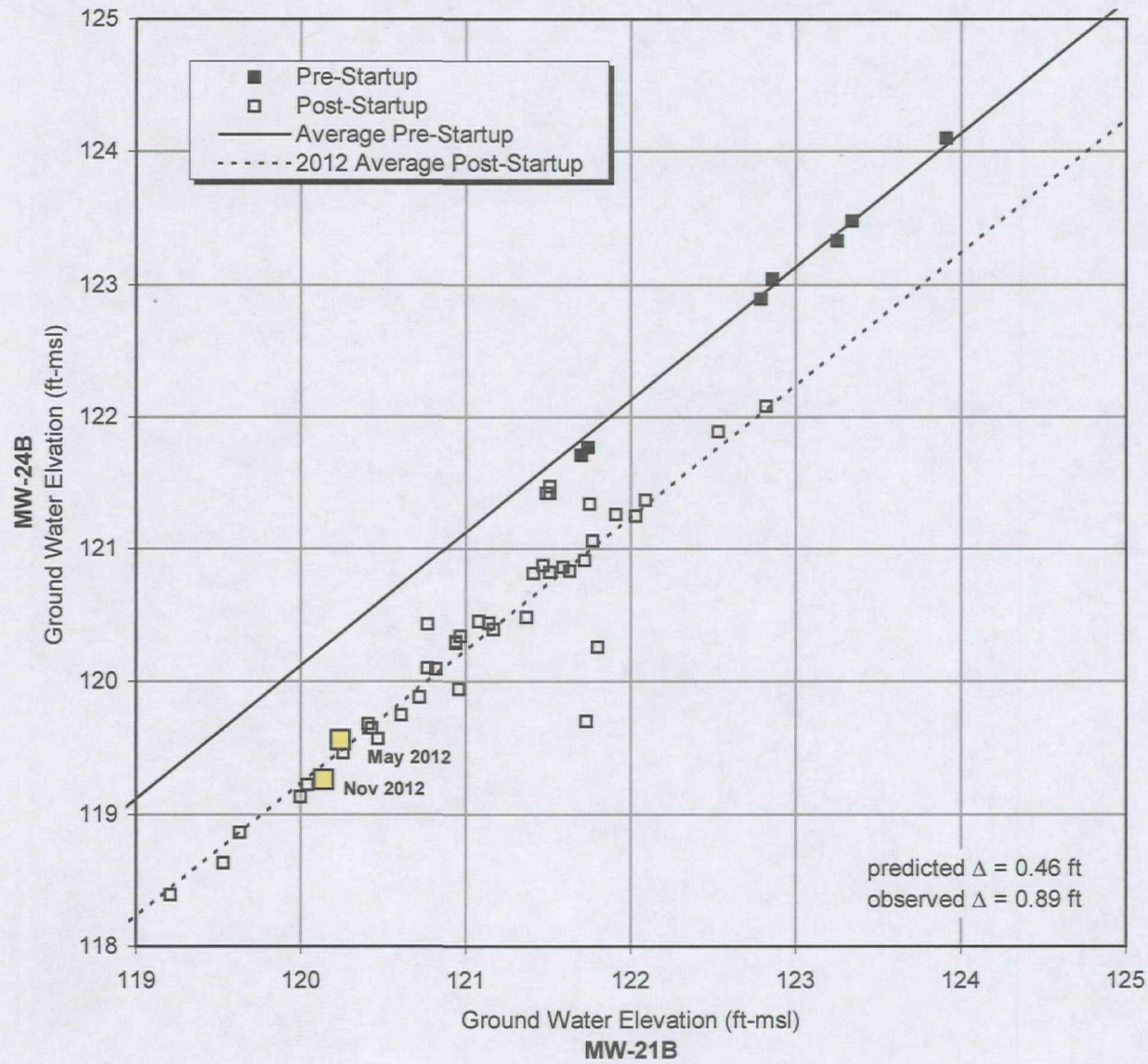
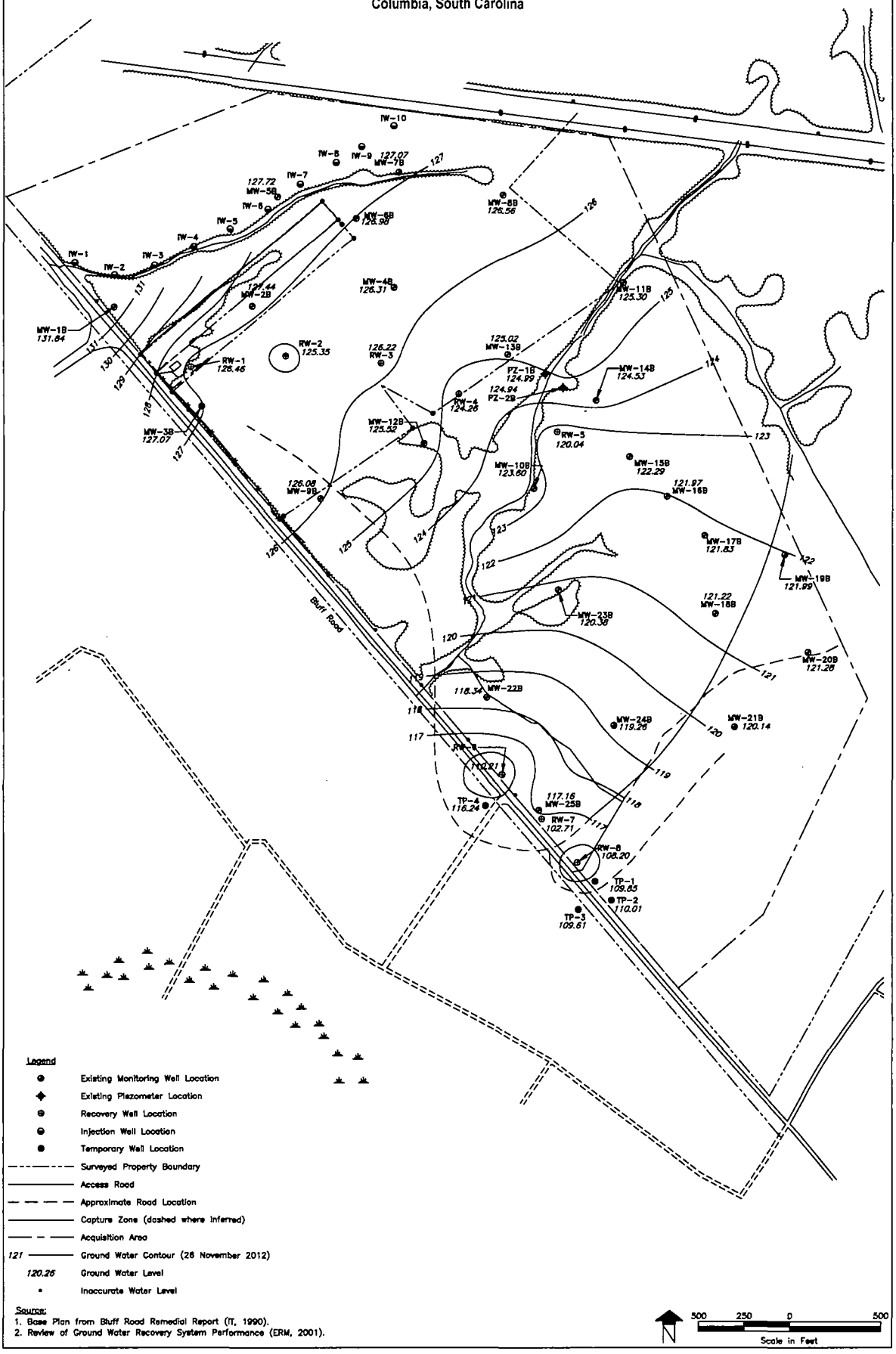


Figure 3
Potentiometric Surface Map
26 November 2012
SCRDI - Bluff Road Site
Columbia, South Carolina



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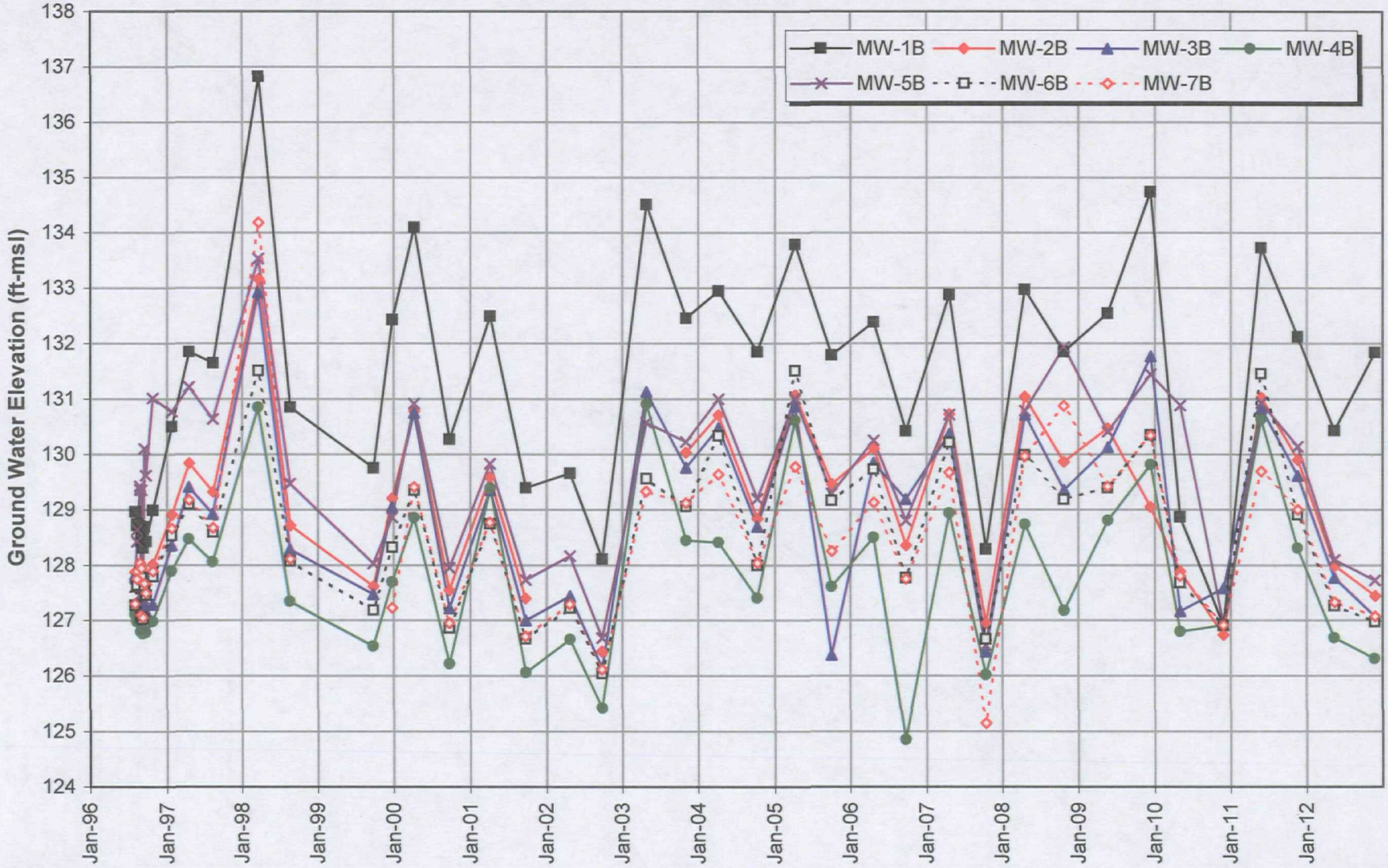
Date Printed: 12/26/2012

Figure 4
Ground Water Elevations in Northern Monitoring Wells
SCRDI Bluff Road Site
Columbia, South Carolina



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Date Printed: 12/26/2012

Figure 5
Ground Water Elevations in Southern Monitoring Wells
SCRDI Bluff Road Site
Columbia, South Carolina

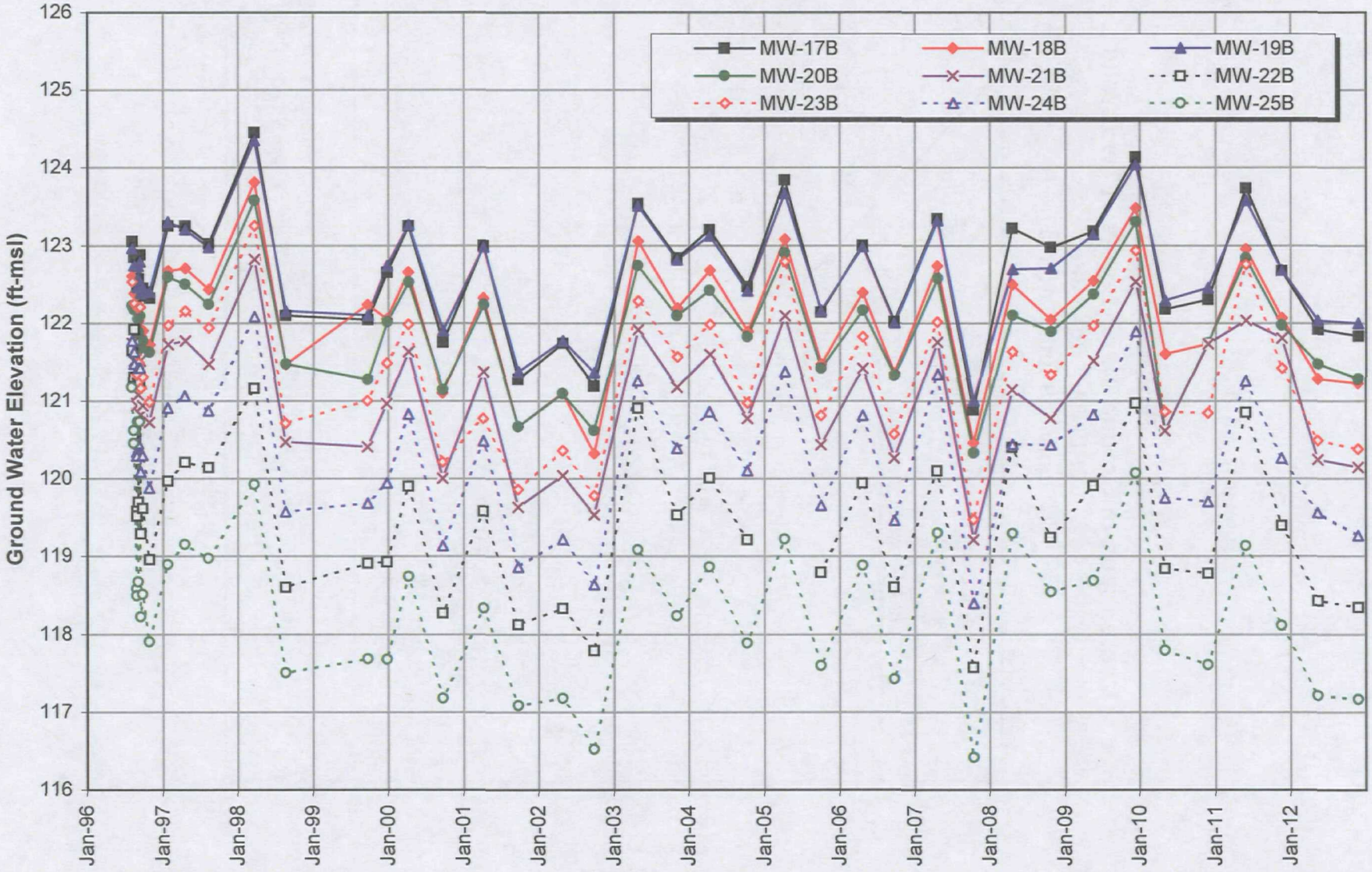


Figure 6
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

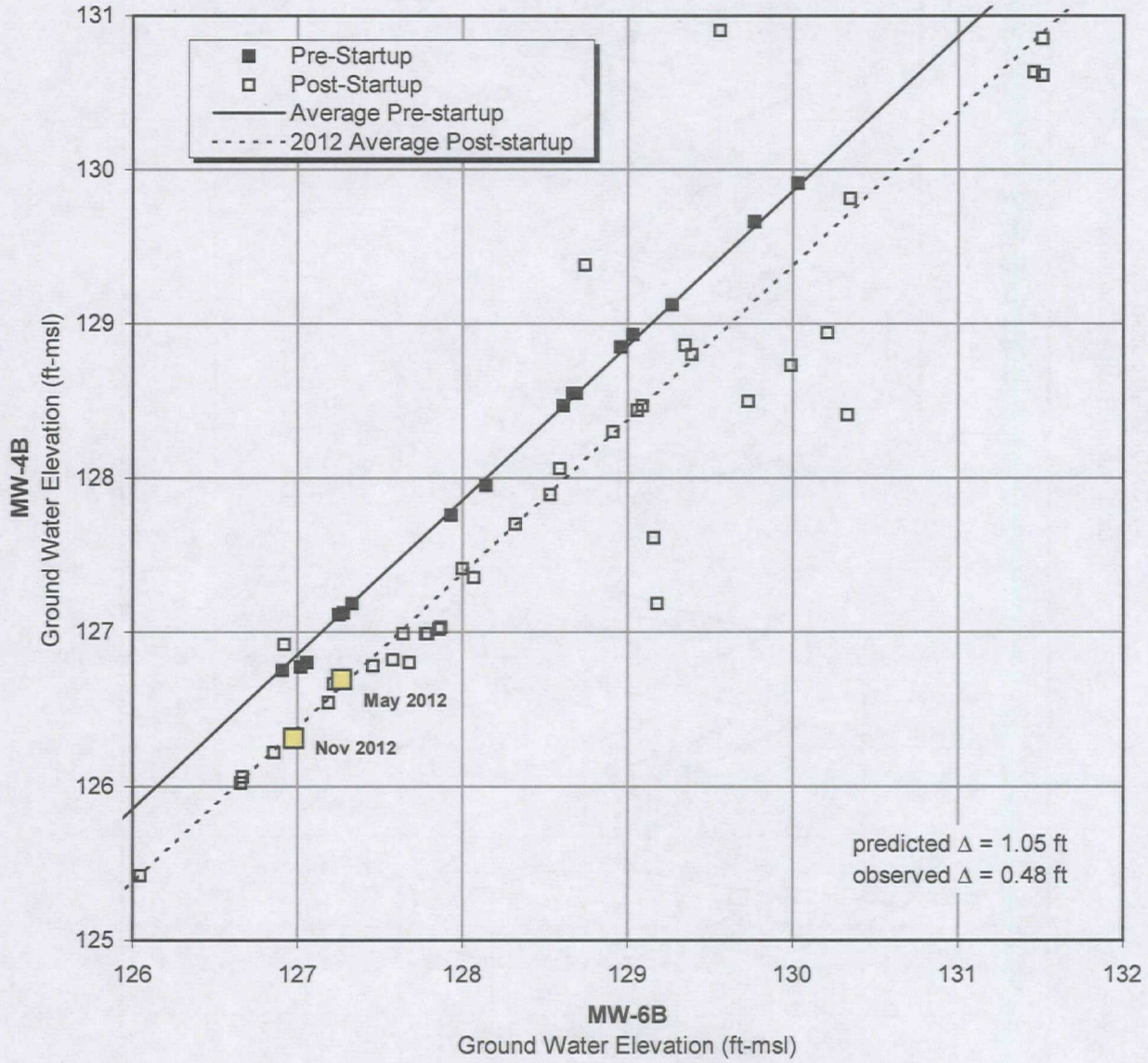


Figure 7
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

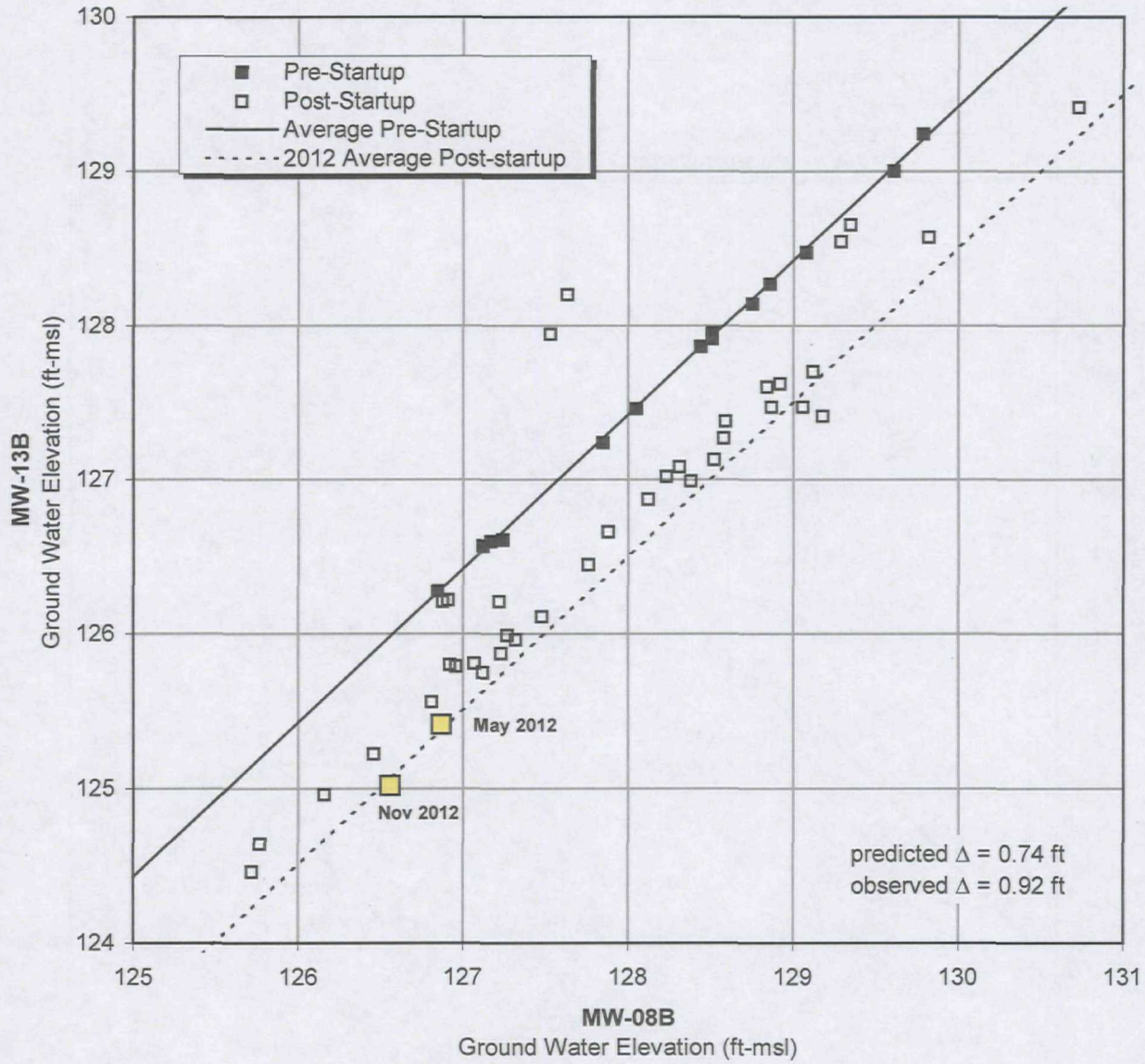


Figure 8
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

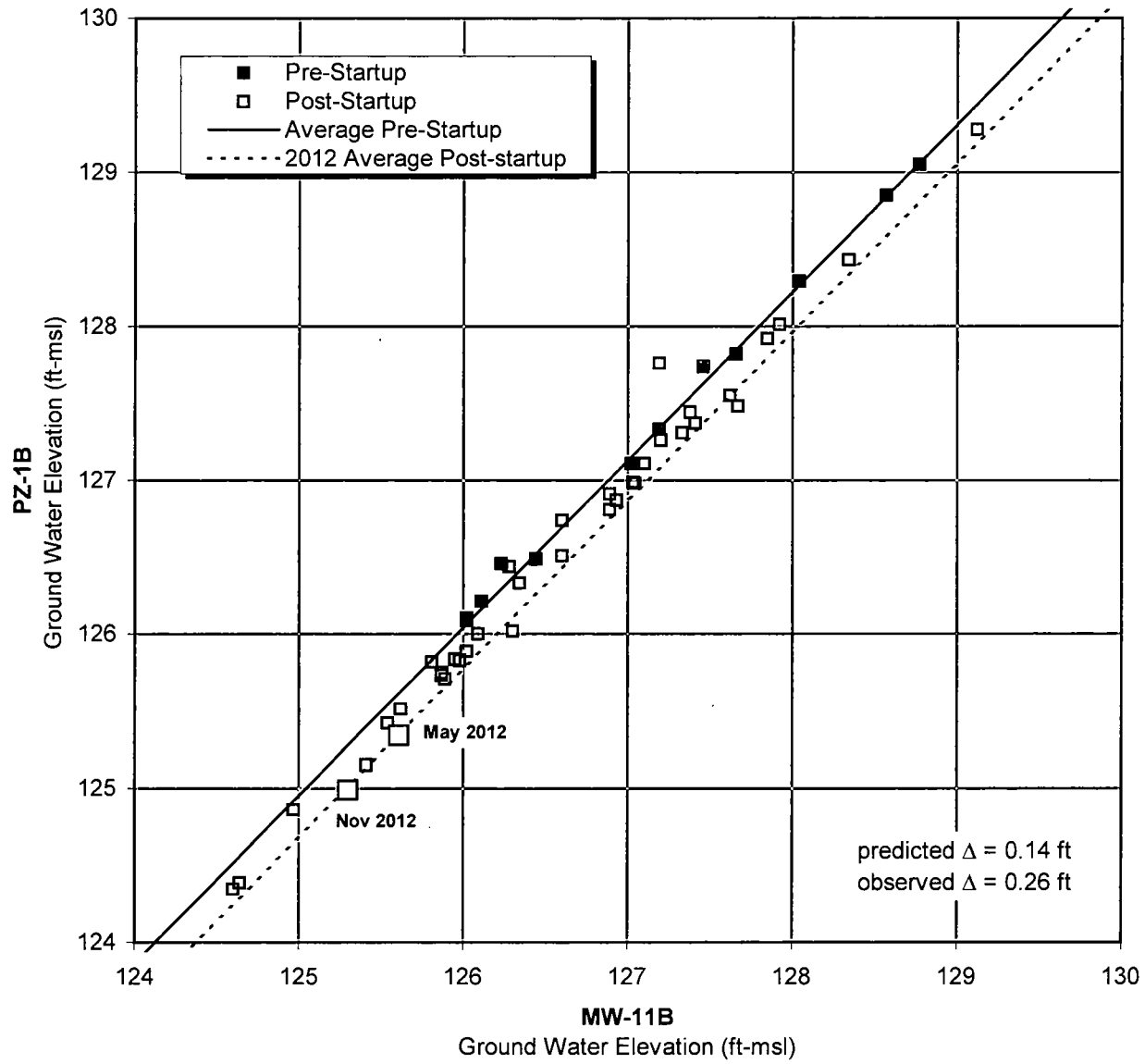


Figure 9
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

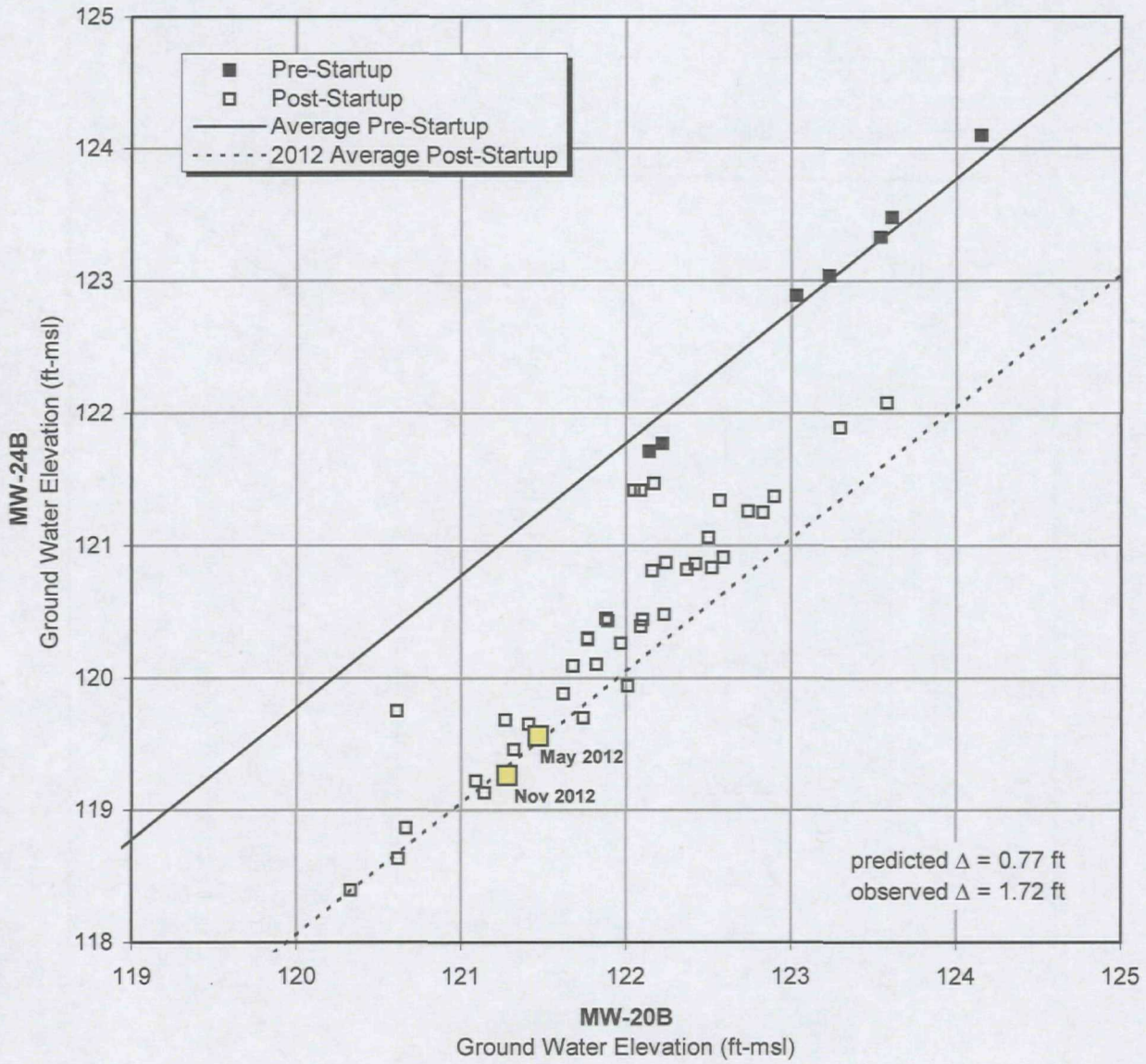


Figure 10
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

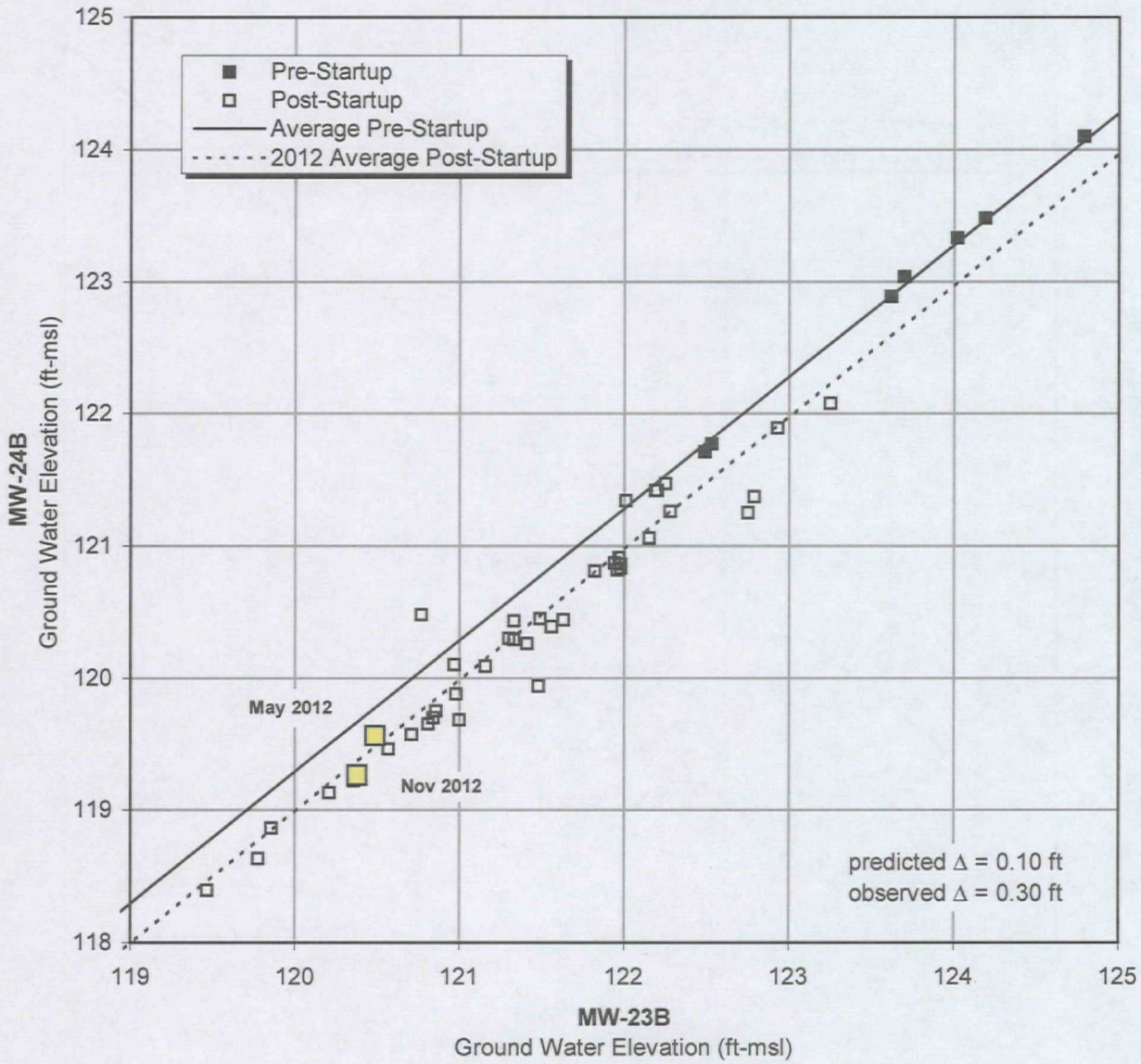


Figure 11
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

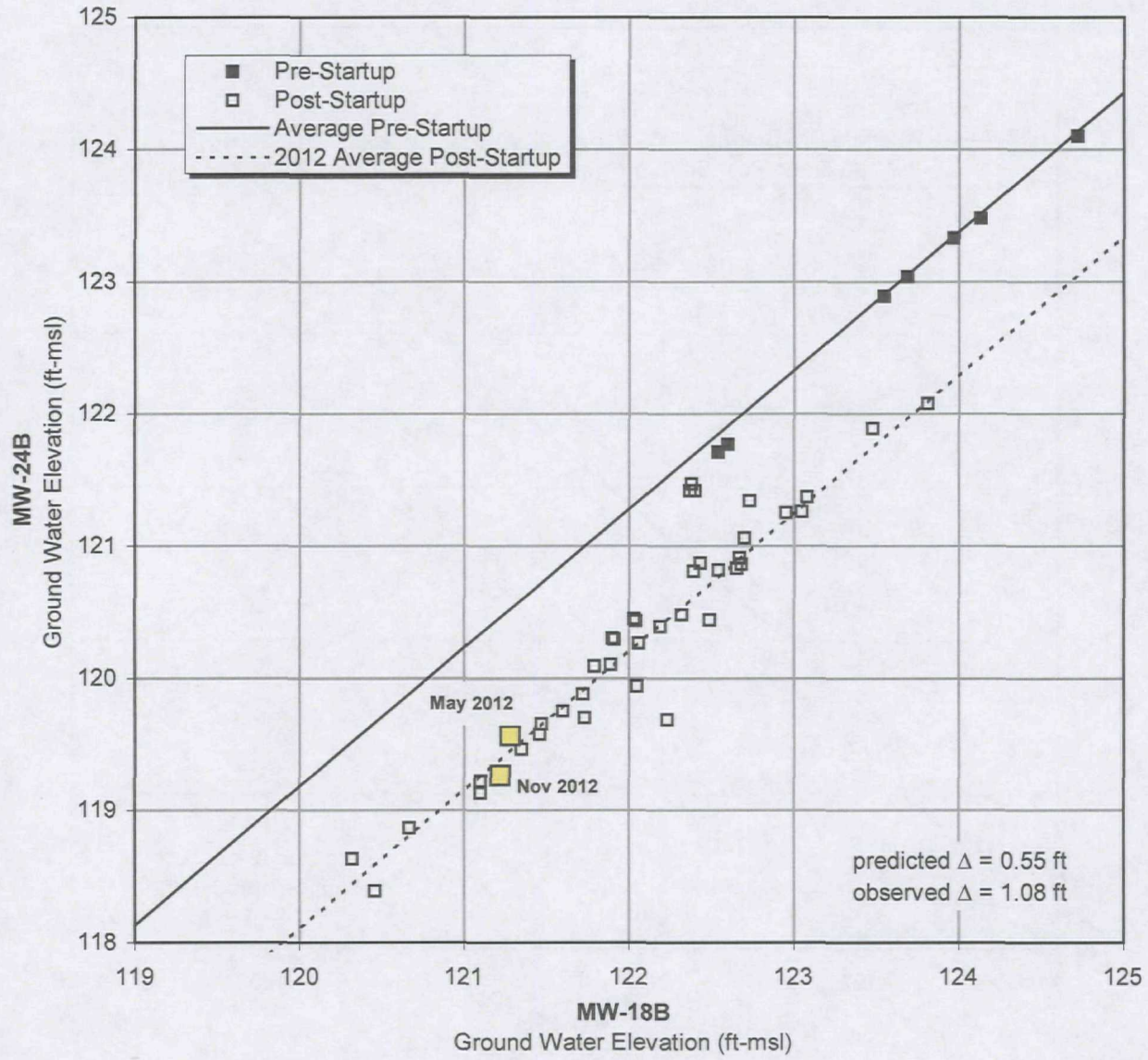


Figure 12
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

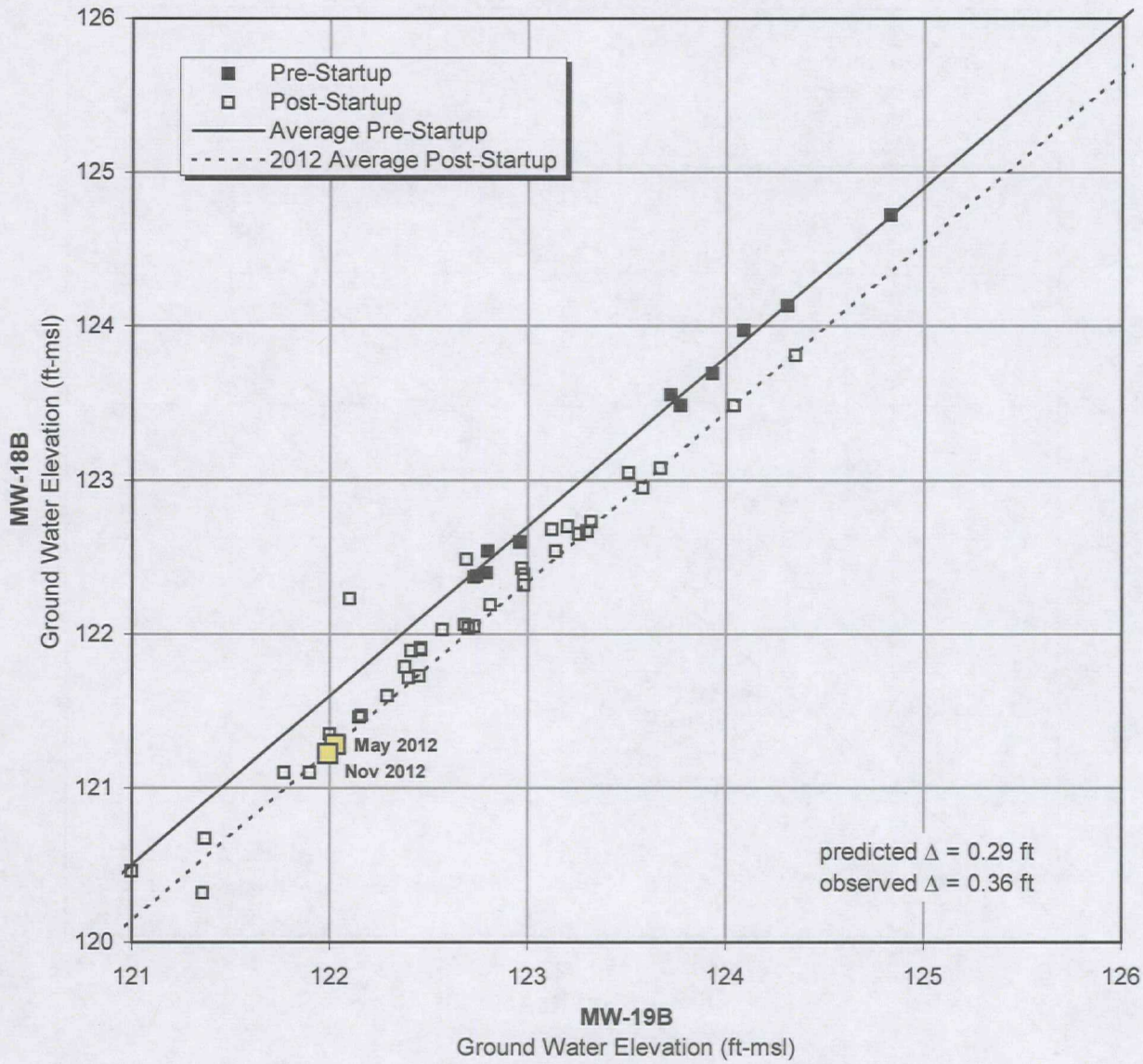


Figure 13
Comparison of Ground Water Levels in Two Wells
SCRDI Bluff Road Site
Columbia, South Carolina

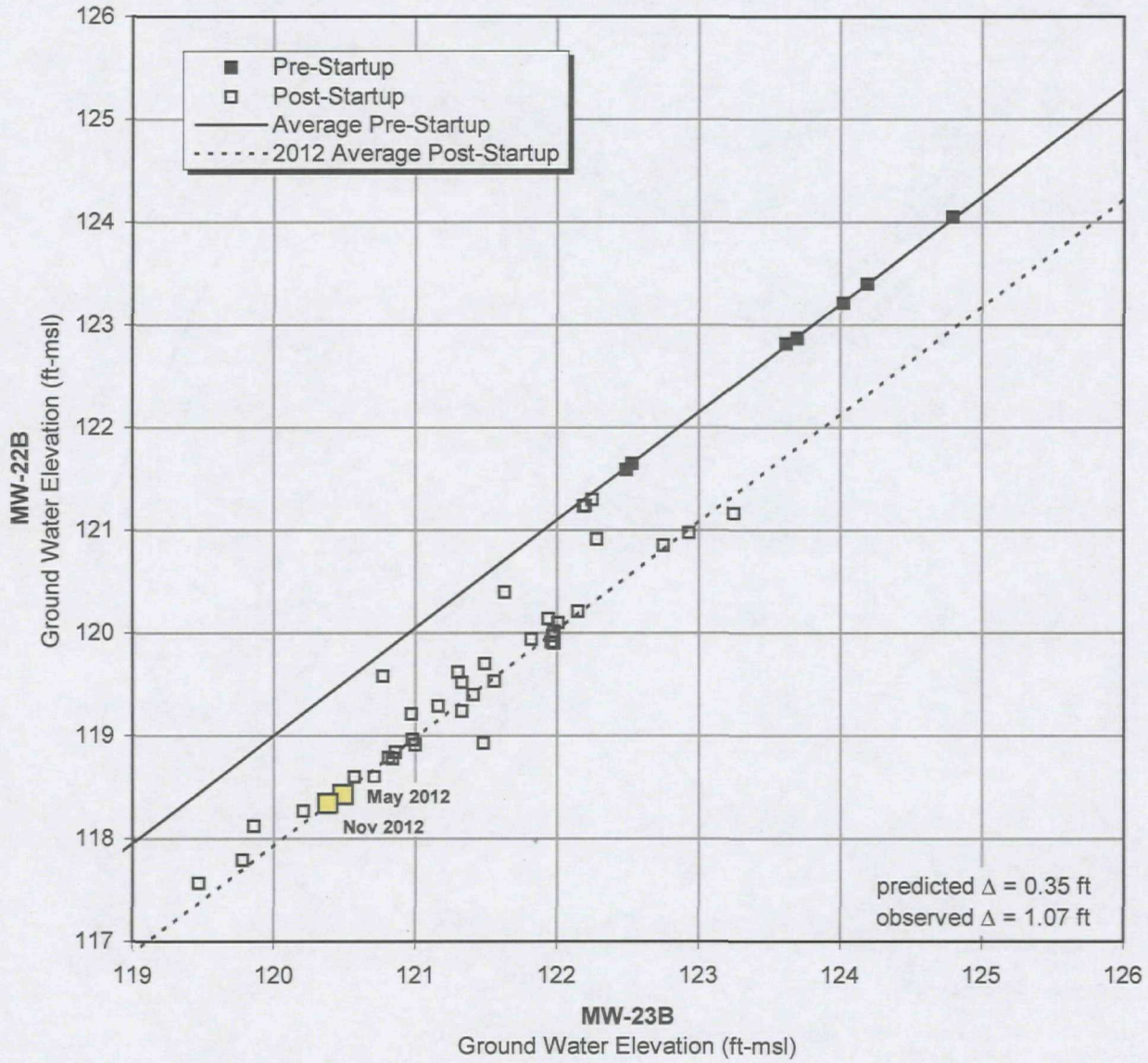
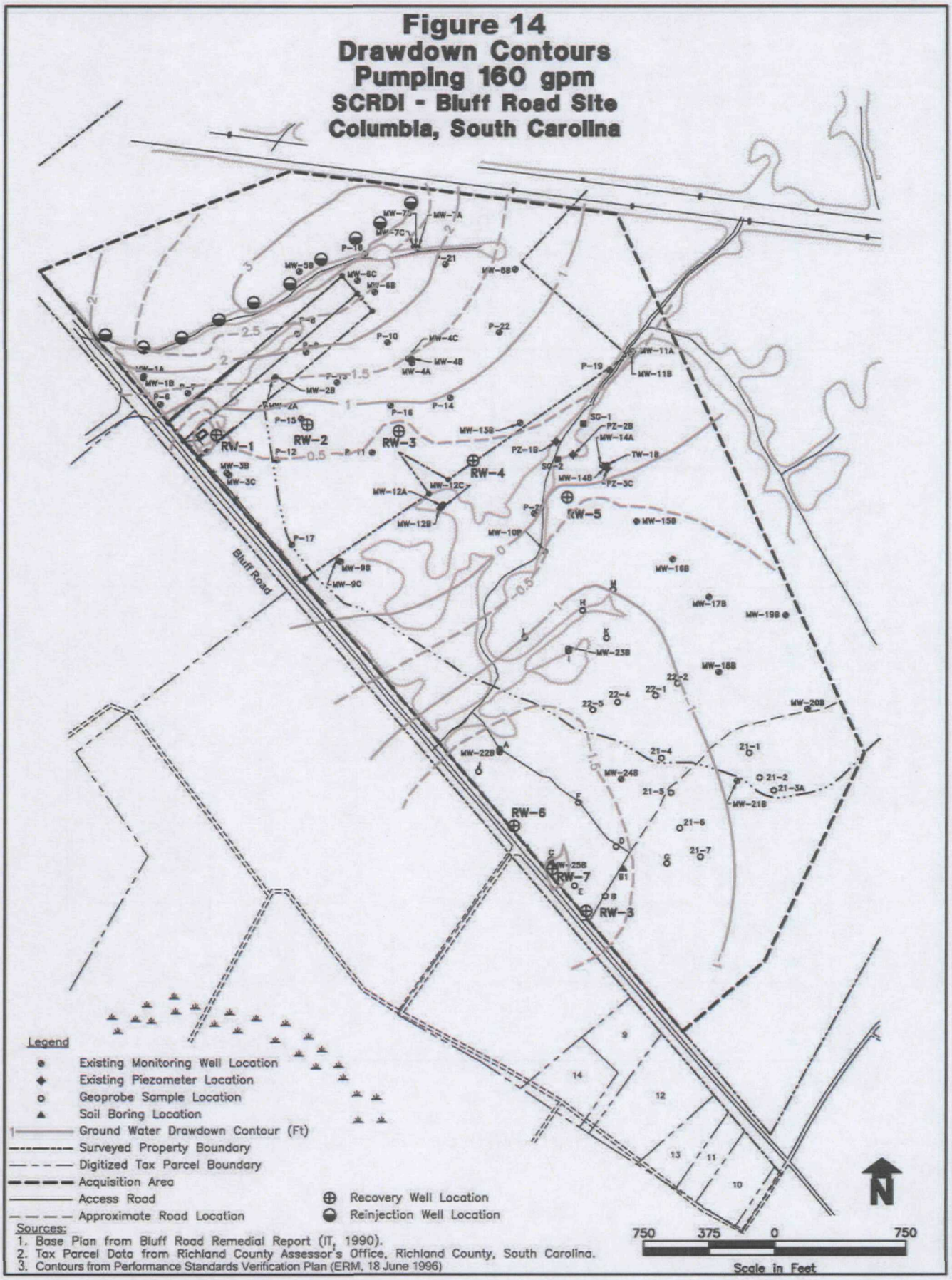
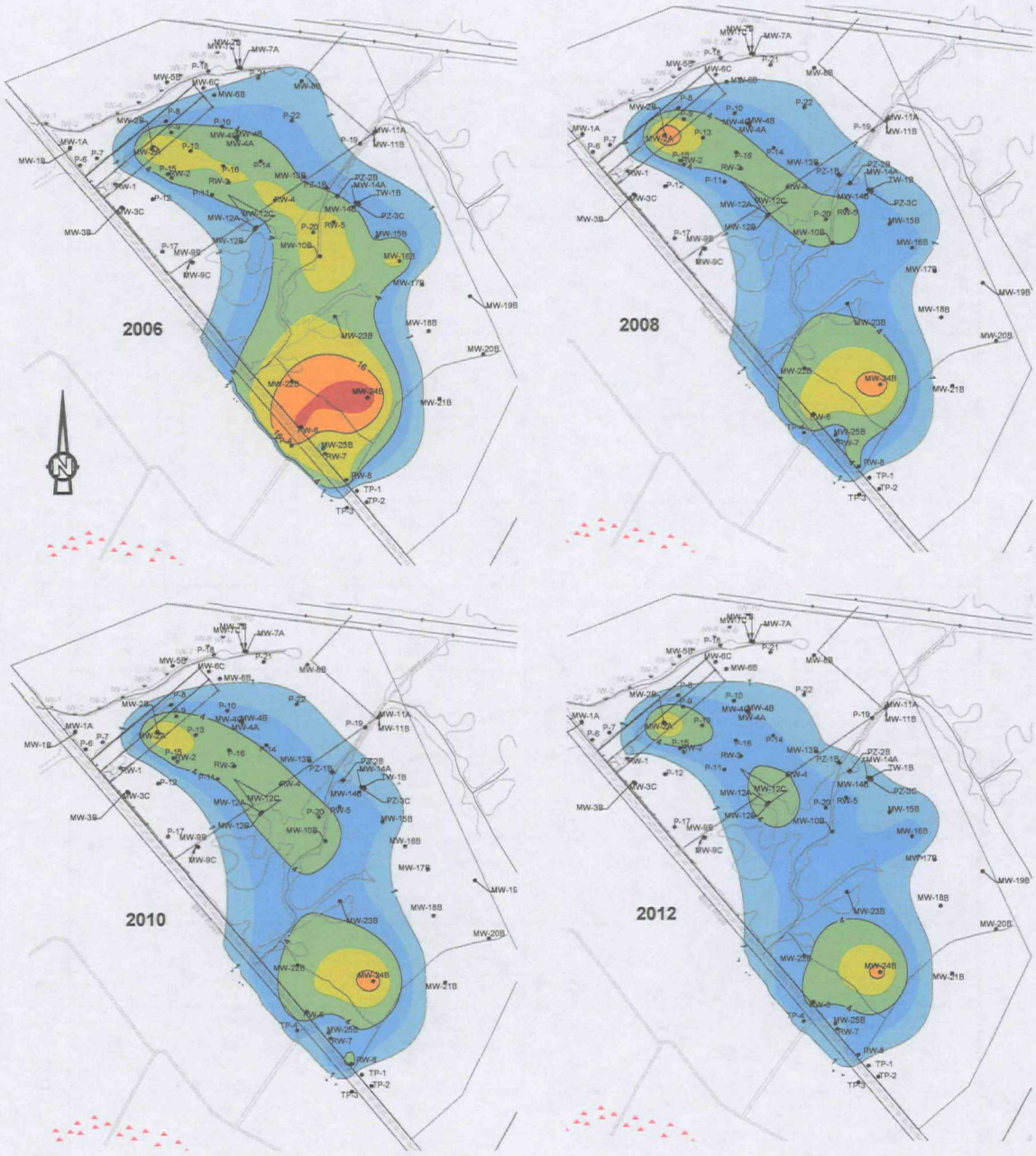


Figure 14
Drawdown Contours
Pumping 160 gpm
SCRDI - Bluff Road Site
Columbia, South Carolina



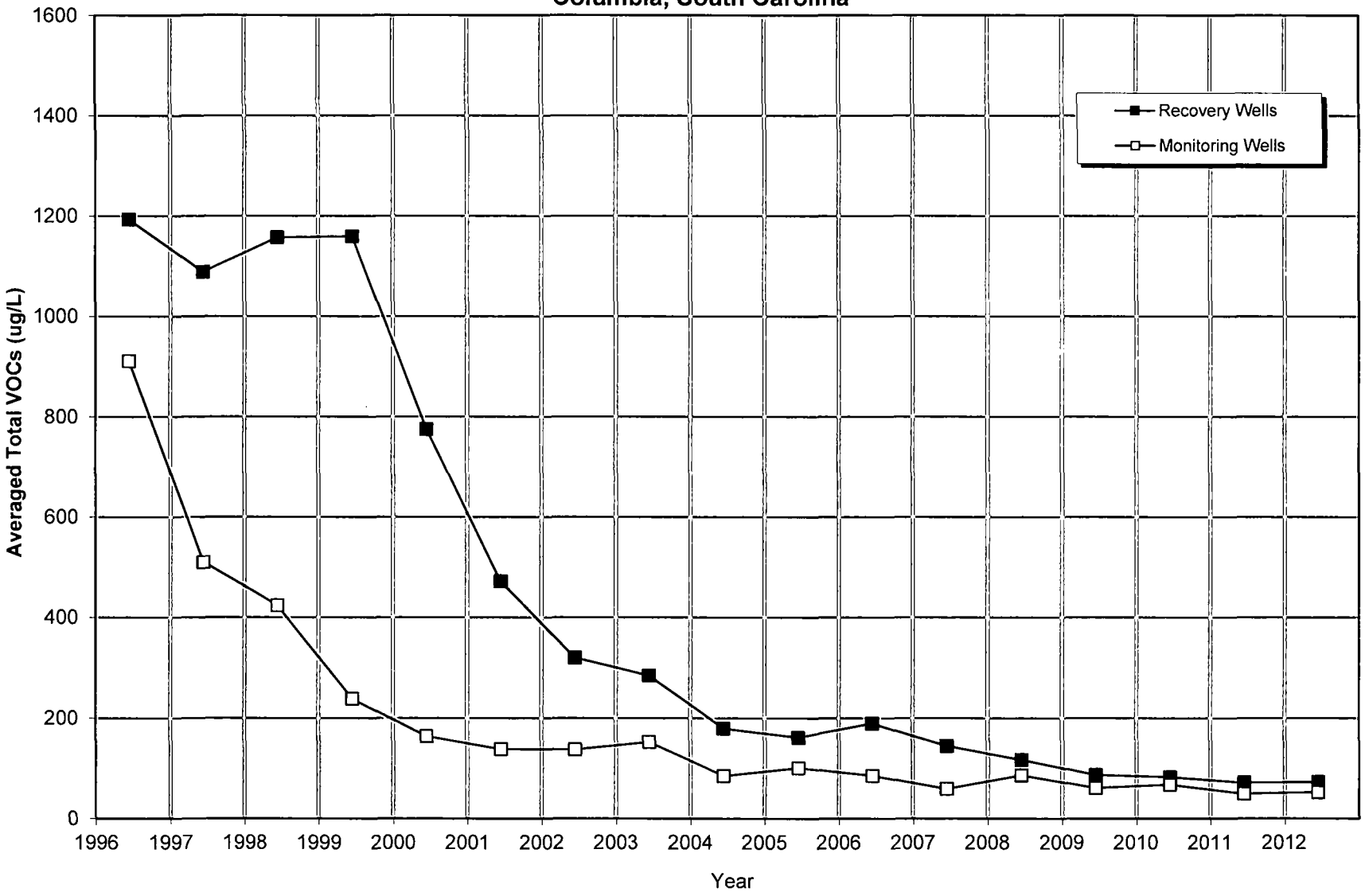
Sources:
1. Base Plan from Bluff Road Remedial Report (IT, 1990).
2. Tax Parcel Data from Richland County Assessor's Office, Richland County, South Carolina.
3. Contours from Performance Standards Verification Plan (ERM, 18 June 1996)

Figure 15
Exceedance of Ground Water Cleanup Criteria
SCRDI – Bluff Road Site
Columbia, South Carolina



Notes:
Contours present the ratio of observed concentration to cleanup level.
The contoured values are the maximum ratio at each well during the year.
The maximum ratio may be for any parameter analyzed for.
Only parameters with Site cleanup levels used.
Acetone and B-qualified data are not included.

Figure 16
Average Ground Water Concentrations
SCRDI Bluff Road Site
Columbia, South Carolina



Attachment A

2013 Conceptual Site Model

REPORT

SCRDI-Bluff Road Site Performing Settlors

Conceptual Site Model

SCRDI-Bluff Road Site
Columbia, South Carolina

20 August 2013

Services Environmental, Inc
375 Morgan Street
Phoenixville, PA

TABLE OF CONTENTS

LIST OF FIGURES

SITE CONCEPTUAL MODEL

This Conceptual Site Model (CSM) provides a summary of environmental conditions for the South Carolina Recycling and Disposal Inc. (SCRDI) Bluff Road site (the Site) on Bluff Road in Columbia, South Carolina. It captures the interpretations of contaminant release, remediation, groundwater flow, transport and exposure pathways discussed in historical investigation reports, and the annual evaluation of remedial performance. The CSM provides a basis for regulators, consultants, responsible parties and the public, to understand and discuss the Site. Data evaluations, tables, graphs, and discussions supporting the CSM have been presented in previous reports.

Figure 1 shows the Site location.

1. OPERATIONS BACKGROUND

The first commercial or industrial operation on the Site was as an acetylene gas manufacturing facility. Specific dates and other details regarding the facility operations are not available. Two lagoons were located on the property to support acetylene manufacturing.

SCRDI began operations in 1976 to store, recycle, and dispose of chemical wastes from a variety of sources, and operated until 1982. At the time SCRDI operations ceased, over 7,500 drums containing chemicals and numerous smaller containers of toxic, flammable, and reactive wastes were being stored on the property.

Figure 2 presents a map of the Site area. The Site area includes the 4-acre parcel leased by SCRDI and the Access Area, property which by access agreement with property owners, has allowed the Performing Settlors to complete investigations and to remediate groundwater impacts. SCRDI operations were generally limited to the southern half of the 4-acre parcel leased by SCRDI.

2. *SOURCE*

The constituents of concern are volatile organic compounds (VOCs). Figure 3 shows the area of soils remediated in 1994-1996 using soil vapor extraction, an outline of the groundwater VOC plume and two location lines for cross sections discussed below. Within the VOC plume outline, groundwater quality exceeds the Cleanup Criteria defined in the 1990 EPA Record of Decision.

Figure 3 also labels the Northern Area and Southern Area. The distinction was defined to distinguish the area where the VOC plume makes a sharp turn to the southwest and the Northern Recovery wells (RW-01 to RW-05) from the Southern Recovery wells (RW-06 to RW-08).

3. *HYDROGEOLOGY*

The subsurface materials are unconsolidated sands, silts, and clays. A cross section line, AA', is shown along the axis of the plume in Figure 3. Figure 4 presents a conceptual cross section along this line.

There are four hydrologic units shown in section AA':

- Surficial silts/clays;
- Shallow Aquifer;
- an Aquitard (separating the Shallow and Deep Aquifer); and
- Deep Aquifer.

Select wells are shown on the section to indicate:

- Typical screened intervals of the A, B and C monitoring wells; and
- Typical screened intervals of the recovery wells (close to fully penetrating the Shallow Aquifer).

Monitoring wells are located in both the Shallow and Deep Aquifers. The Shallow Aquifer wells have either "A" or "B" suffix (e.g., MW-02A and MW-02B) indicating a screened interval near the top or bottom of the aquifer, respectively. Monitoring wells with a "C" suffix are screened near the top of the Deep Aquifer.

Monitoring wells typically have 10-foot long screens. Recovery wells (e.g., RW-05) are screened near the center or bottom of the Shallow Aquifer and have long screened intervals (generally 20 to 30 feet).

Groundwater impacts are limited to the Shallow Aquifer. The Deep Aquifer has been investigated, with a final sampling event in 1997, and it has not been impacted by VOCs. An Aquitard separates the Shallow and Deep Aquifers. The Aquitard is a low permeability clay layer and is continuous within the area of investigation. Figure 5 presents an isopach (thickness) map of the Aquitard in the Northern Area of the Site. Most of the Southern Area wells went deep enough to encounter the Aquitard clays, however, none of these wells penetrated the Aquitard to determine the thickness.

The Shallow Aquifer has two distinct areas of reduced hydraulic conductivity:

- Between the Northern and Southern areas of the Site; and
- Between wells RW-07 and RW-08.

The cross section in Figure 4 shows a silty sand between wells RW-05 and MW-16B. This material has lower conductivity "silty sand" inferred from inspection of hydraulic gradient data. Figure 6 shows the Shallow Aquifer potentiometric surface prior to operation of the groundwater water recovery system. Between wells RW-05 and MW-16B, the hydraulic gradient increases from five to seven times compared to conditions to the north and south. This change in gradient can only be related to a decrease in hydraulic conductivity.

The cross section in Figure 7 presents geologic conditions along section BB' at the southern end of the plume. There is a significant change in groundwater levels between recovery wells RW-07 and RW 08 (~10 feet as shown in Figure 7). The water level change occurs in a distance of 300 feet or less. The change is much greater than observed between the northern and southern areas of the Site and indicates that the sands encountered at RW-08 are hydraulically distinct from the Shallow Aquifer at RW-06 and RW-07.

Well RW-08 is impacted by Site-related VOCs. Three temporary piezometers (TP-1 to TP-3) were installed in the same sands as RW-08. Site-related VOCs have not been detected in these piezometers. TP-3 continues to be sampled semi-annually.

Conceptual non-pumping groundwater flow patterns for the Shallow Aquifer are presented in Figures 8 and 9, regional- and Site-scale conditions, respectively. Water level data are only available for wells within the Access Area; interpretations outside of the area of investigation are based on professional judgment. The regional map shows

groundwater flow towards surface water bodies; to the east of the Site, Myers Creek and to the west southwest Mill Creek. Mill Creek is the larger of the two water bodies and the water levels are approximately 15 feet lower than levels in Myers Creek. The dog-leg turn in the Site VOC Plume between the Northern and Southern Areas is attributed to:

- Difference in head between Myers Creek and Mill Creek,
- Lower permeability sediments between the Northern Area and Mill Creek, and
- Good communication between the Shallow Aquifer in the Southern Area and Mill Creek.

The Site-scale map, Figure 9, shows the low permeability areas in the Shallow Aquifer, discussed previously. There is also an area of occasional high recharge at the very northern end of the plume. This is evidenced by occasional large increased in water levels at wells in this area. This recharge influences groundwater flow patterns near the source area and explains the relatively wide plume along the line of injection wells.

4. TRANSPORT

The contaminants of concern are limited to VOCs. The VOCs that exceeded a groundwater Cleanup Criteria in 2012 were:

- carbon tetrachloride
- chloroform
- tetrachloroethene
- trichloroethene
- 1,1 dichloroethene
- 1,2 dichloroethene
- 1,1 dichloroethane
- 1,1,2,2 tetrachloroethane

Reductions in concentrations appear to be the result of mechanical dispersion, aquifer flushing, and removal by the recovery wells.

Figure 10 shows how the VOC plume migrated within the Shallow Aquifer from the source area to Bluff Road. Near the source, the plume is near the top of the aquifer. The plume migrates downward and laterally, and within 1,000 feet of the source area, the highest VOC levels are found near the bottom of the Shallow Aquifer. The Shallow Aquifer monitoring wells which are currently included in the monitoring program were

selected based on this plume configuration. At the Northern end of the plume, near the SCRDI property shallow well MW-02A, is monitored. Downgradient of the SCRDI property and throughout the Southern end of the plume the "B" wells near the bottom of the Shallow Aquifer are monitored. VOCs are migrating along the plume axis at a velocity between 100 to 400 feet per year.

Groundwater quality in 2012 either meets cleanup criteria or is improving in most of the wells sampled at the Site. Figure 11 presents a contour map of Exceedance Factors (EF) in 2012. The EF is the ratio of observed concentrations to Cleanup Criteria; a value greater than 1.0 indicates an exceedance of the criteria. The map contours were based on the maximum EF for any individual parameter at each well. In the figure, the majority of the plume area is within a factor of four of the Cleanup Criteria.

The VOC plume extends to well TP-04 on the west side of Bluff Road. In 2012, VOC levels at TP-04 were below Cleanup Criteria for all VOCs except 1,1,2,2 tetrachloroethane which was less than a factor of two above its Cleanup Criterion (0.6 ug/L).

Several monitoring wells ("C" wells) were installed in the Deep Aquifer. None of the Deep Aquifer wells contained VOCs and the Aquitard separating the Shallow and Deep Aquifer is continuous.

5. *EXPOSURE*

There are no current exposure pathways. The soils have been remediated and there are no wells, homes or businesses within the limits of the groundwater plume. Potential transport to surface water discharge at Mill Creek was evaluated in the Southwest Area Investigation Report of January 12, 1998 assuming that no remedial actions were taken. The analysis indicated that there was no threat to Mill Creek. Sampling of surface water from Mill Creek in March and August 1998 indicated no impact.

6. *REMEDIATION*

Removal of drums and of visibly contaminated surface soils was conducted in 1982 and 1983 under the direction of USEPA and SCDHEC.

Soils impacted by VOCs were remediated from 1994 to 1996 using soil vapor extraction (SVE). The area remediated with SVE is shown in Figures 3 and 12. The EPA approved the soil remedy completion in 1997.

A groundwater pump and treat remediation was installed and started in 1996. The system consists of eight recovery wells, ten injection wells and a treatment system with air stripping and carbon polishing prior to reinjection. The total pumping rate is approximately 130 gpm. One hundred percent of the recovered groundwater is treated to injection permit requirements and reinjected hydraulically upgradient of the VOC plume. Figure 2 shows the locations of the recovery and injection wells.

Groundwater quality either meets cleanup criteria or is improving in most of the wells sampled. Concentration versus time graphs for all of the wells regularly sampled are include in the annual evaluation report for the groundwater recovery system.

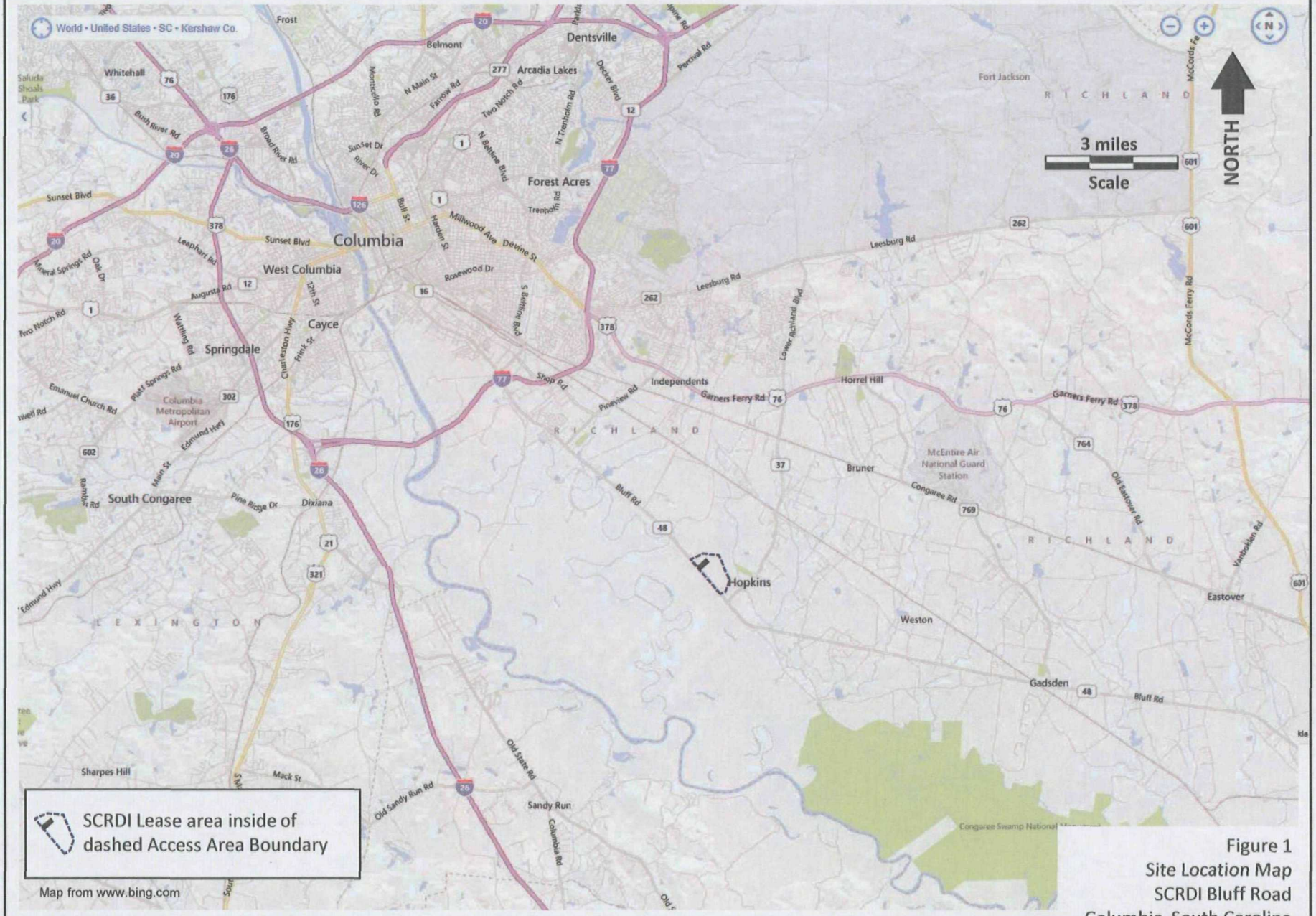


Figure 1
Site Location Map
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

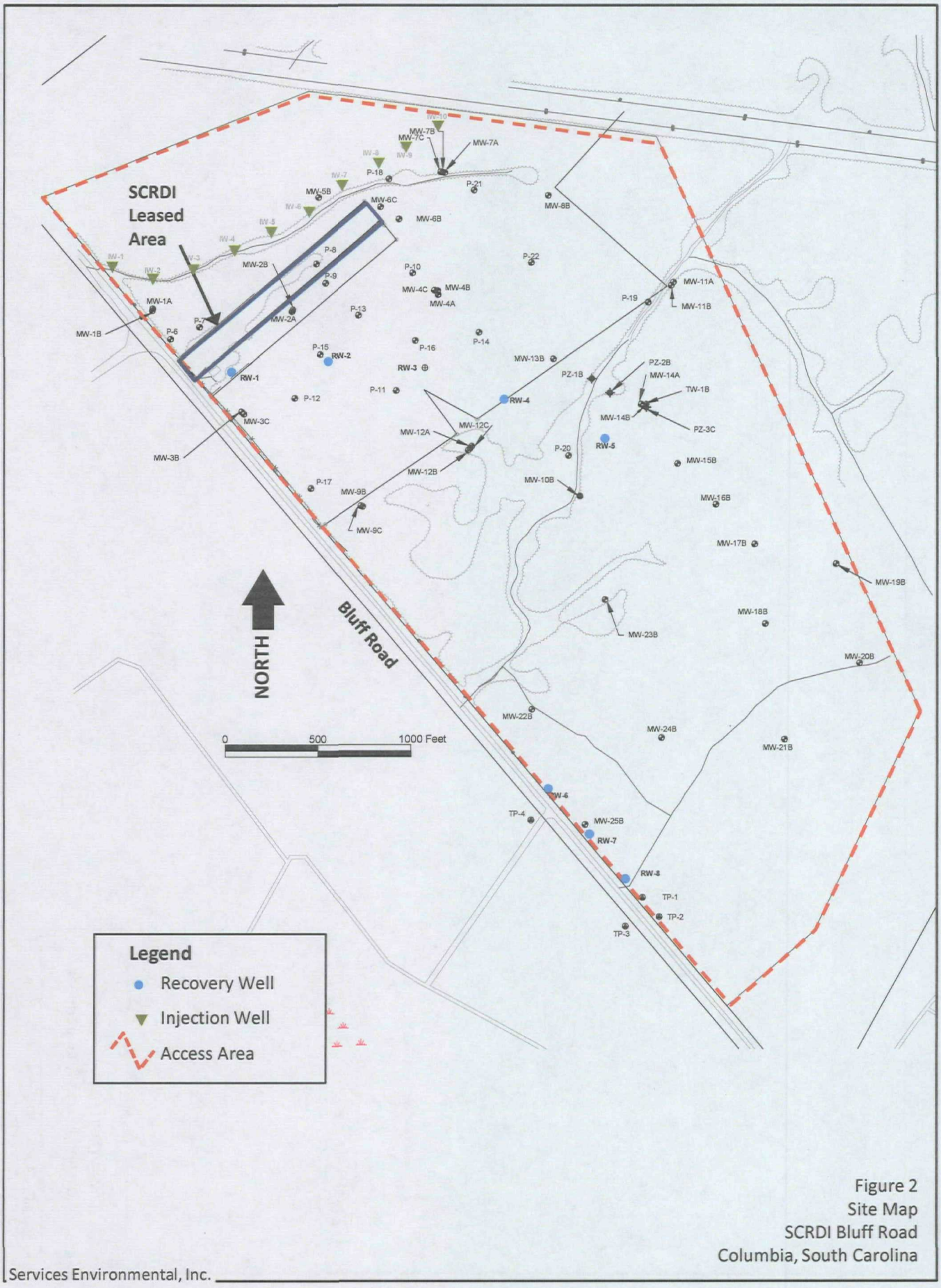


Figure 2
Site Map
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

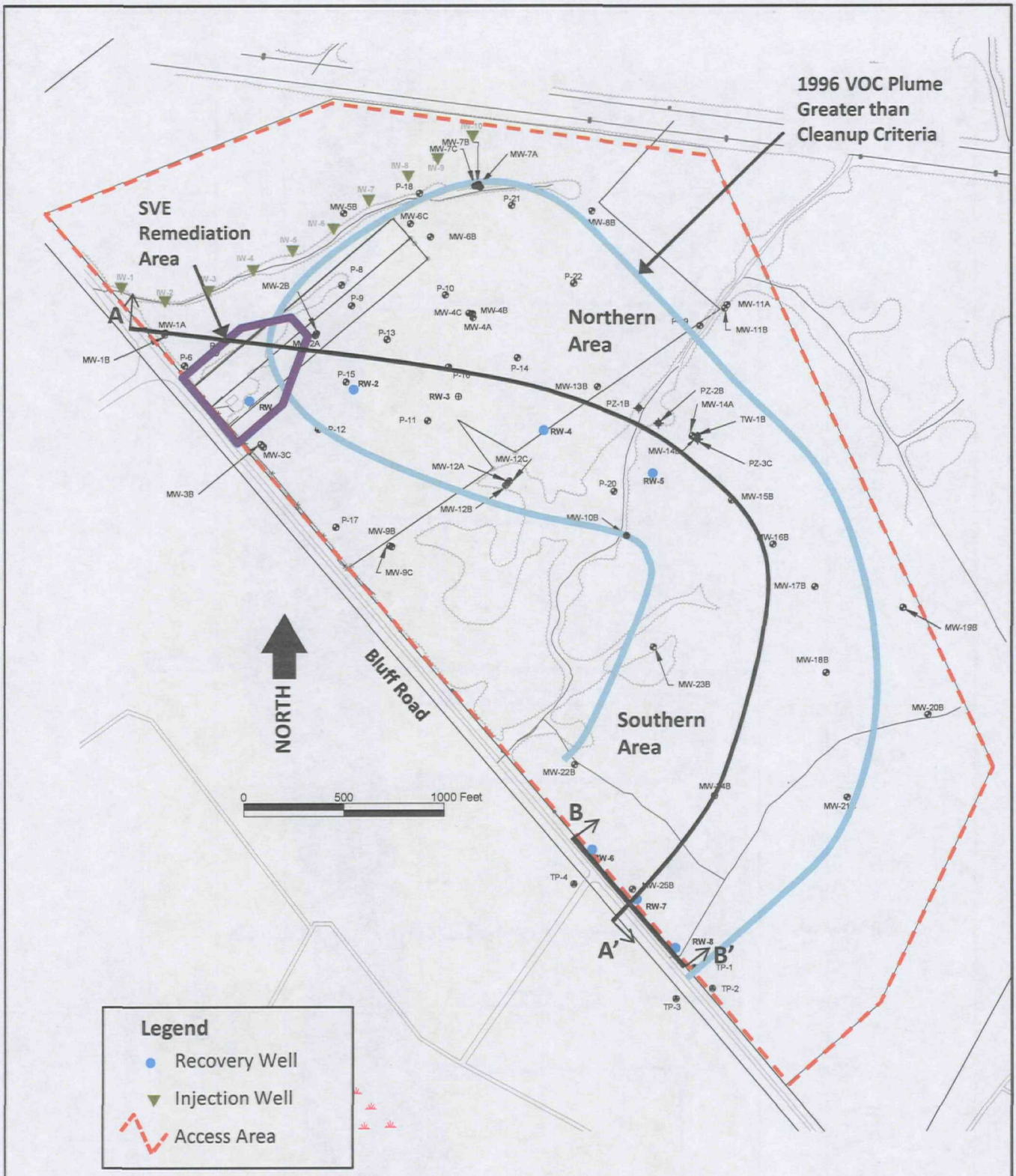


Figure 3
VOC Plume, SVE Area and Cross Section Locations
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

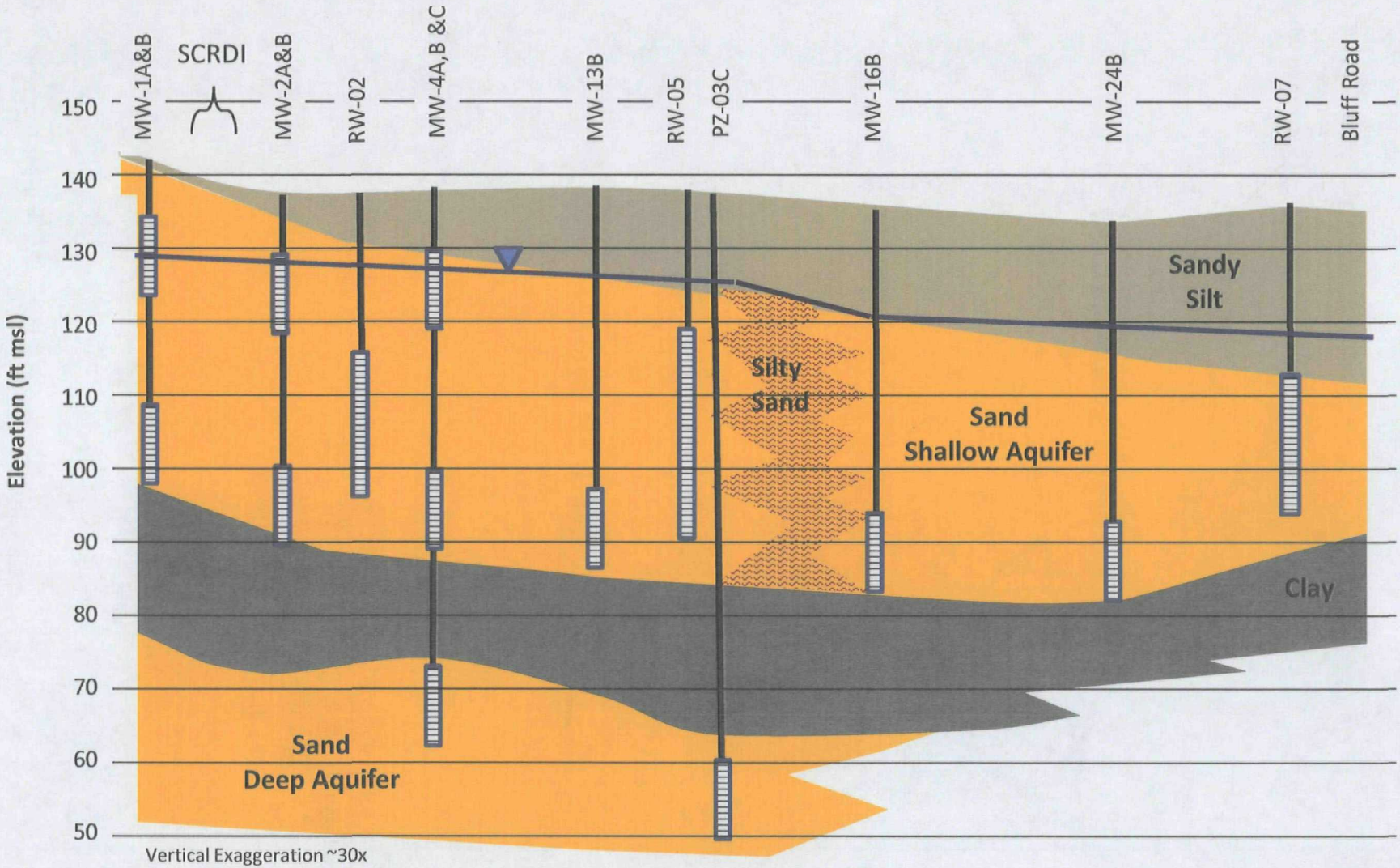
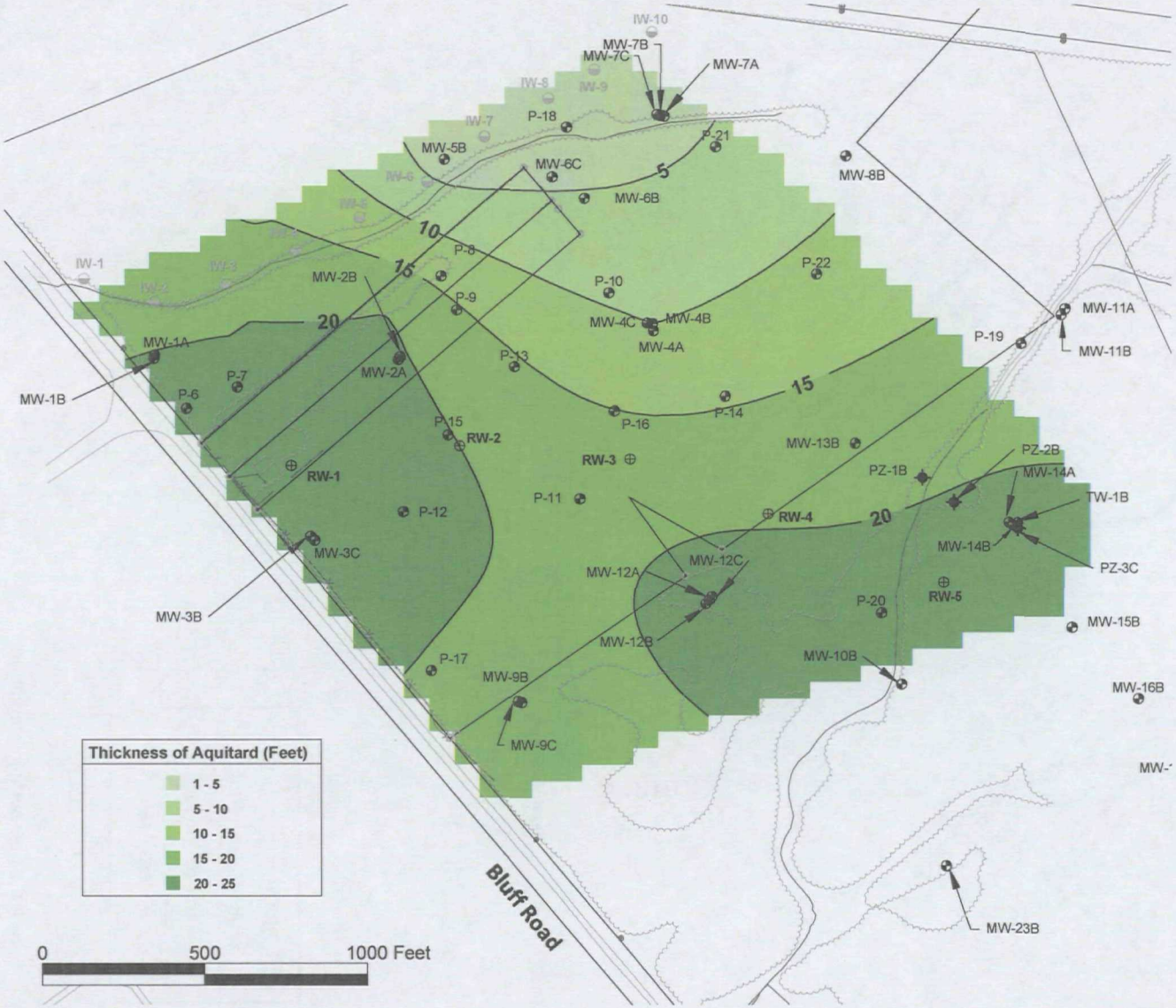


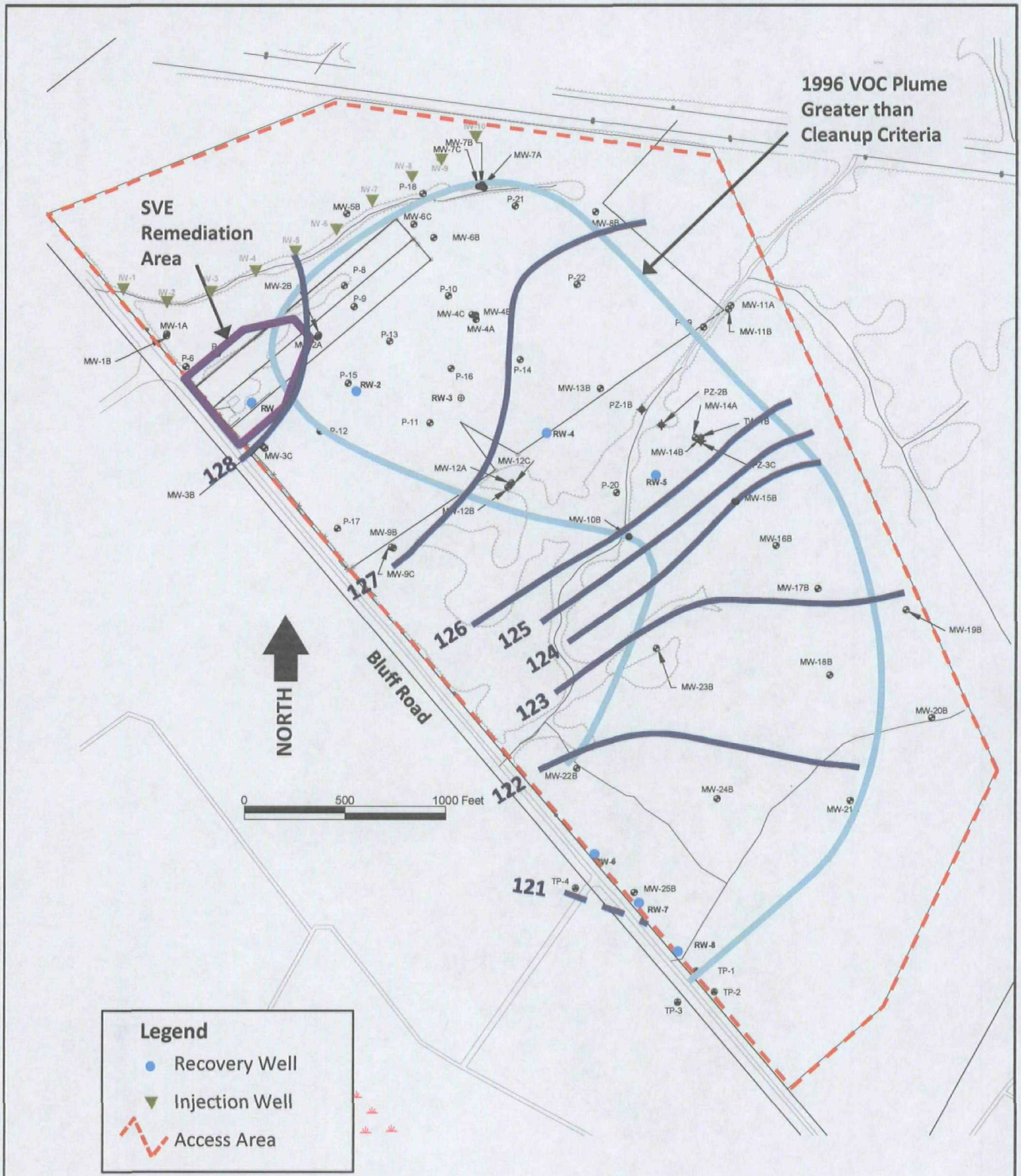
Figure 4
Cross Section along VOC Plume Axis
SCRDI Bluff Road
Columbia, South Carolina



Isopach data are from MW-03C, MW-04C, MW-06C, MW-07C, MW-09C, MW-12C, MW-05B and PZ-03C

Figure 5
Isopach Map of Aquitard Separating the Shallow and Deep Aquifers
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

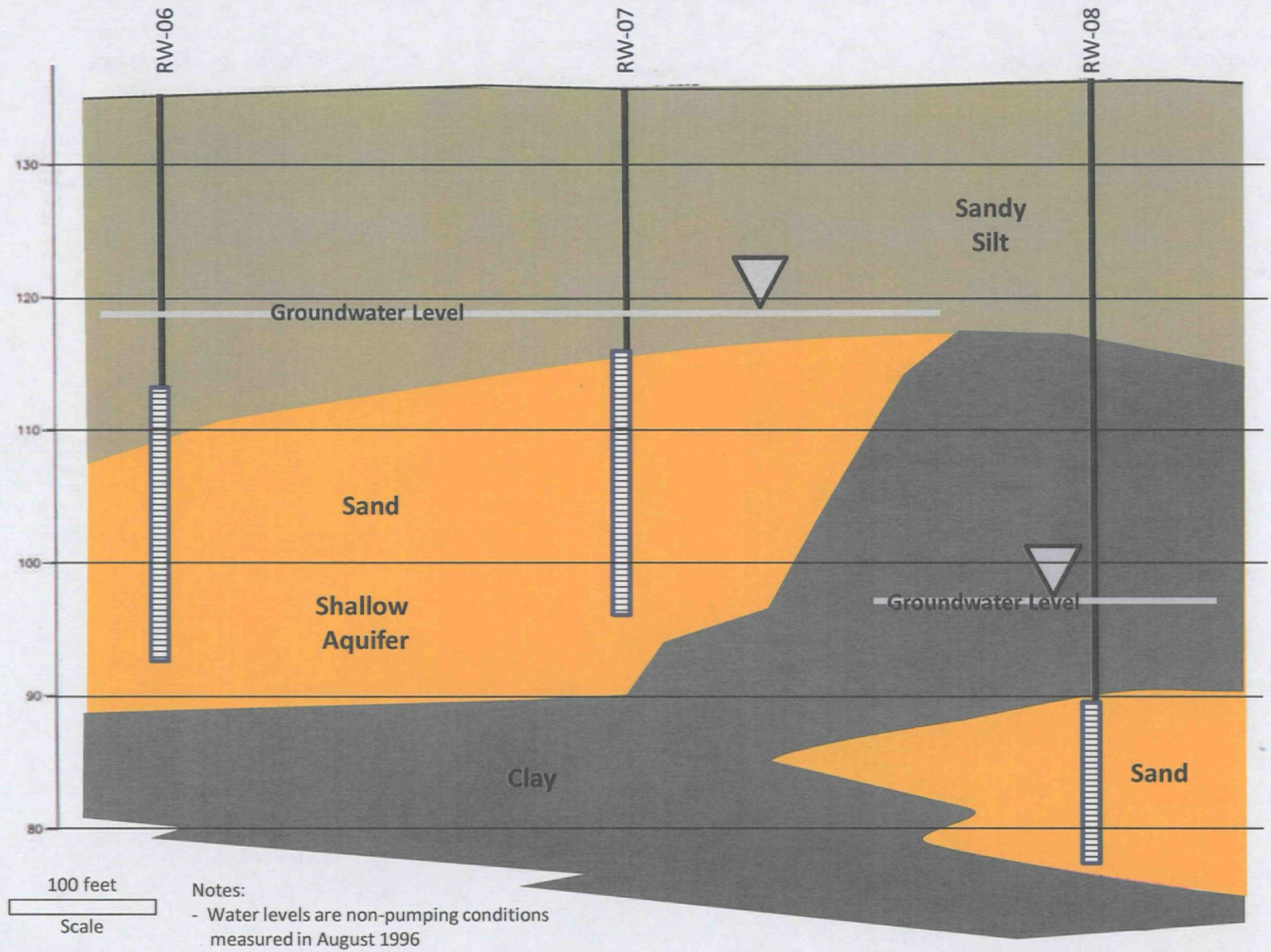


Notes:

- Water levels are non-pumping conditions measured in August 1996
- Contours adapted from 1996 ERM Remedial Action Report
- Contours in feet above mean sea level

Figure 6
Non-Pumping Potentiometric Surface
August 1996
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.



Notes:
- Water levels are non-pumping conditions measured in August 1996
- Vertical Exaggeration ~10x
- Figure adapted from 1996 ERM Remedial Action Report

Figure 7
Cross Section Along Southern Recovery Wells
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

Note: Groundwater flow arrows outside of the Access Area are based on professional judgment

0 ½ 1

Scale in Miles

Figure 8
Regional-Scale CSM for the Shallow Aquifer
Non-pumping Conditions
SCRDI Bluff Road
Columbia, South Carolina

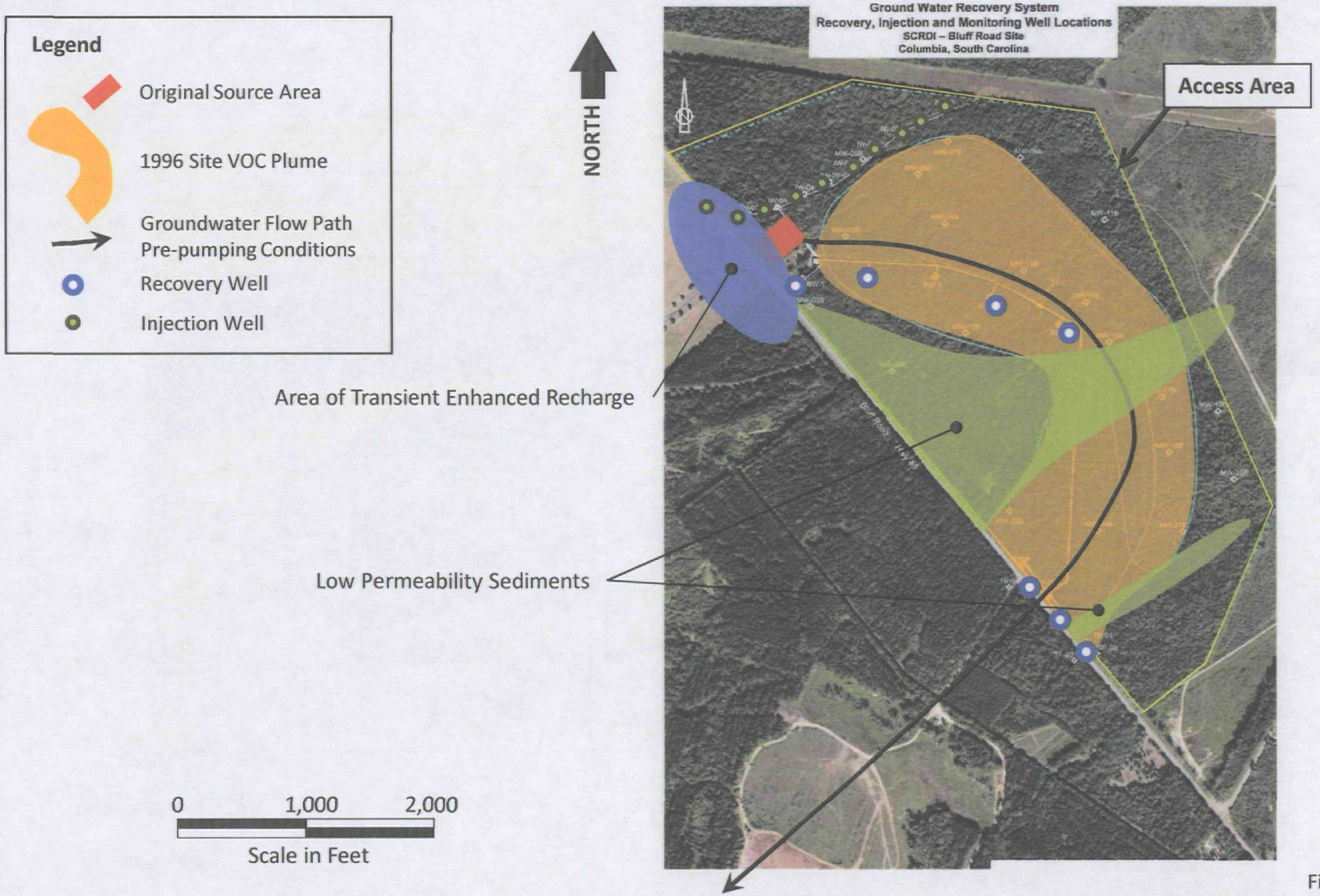


Figure 9
Site-Scale CSM for the Shallow Aquifer
Non-pumping Conditions
SCRDI Bluff Road
Columbia, South Carolina

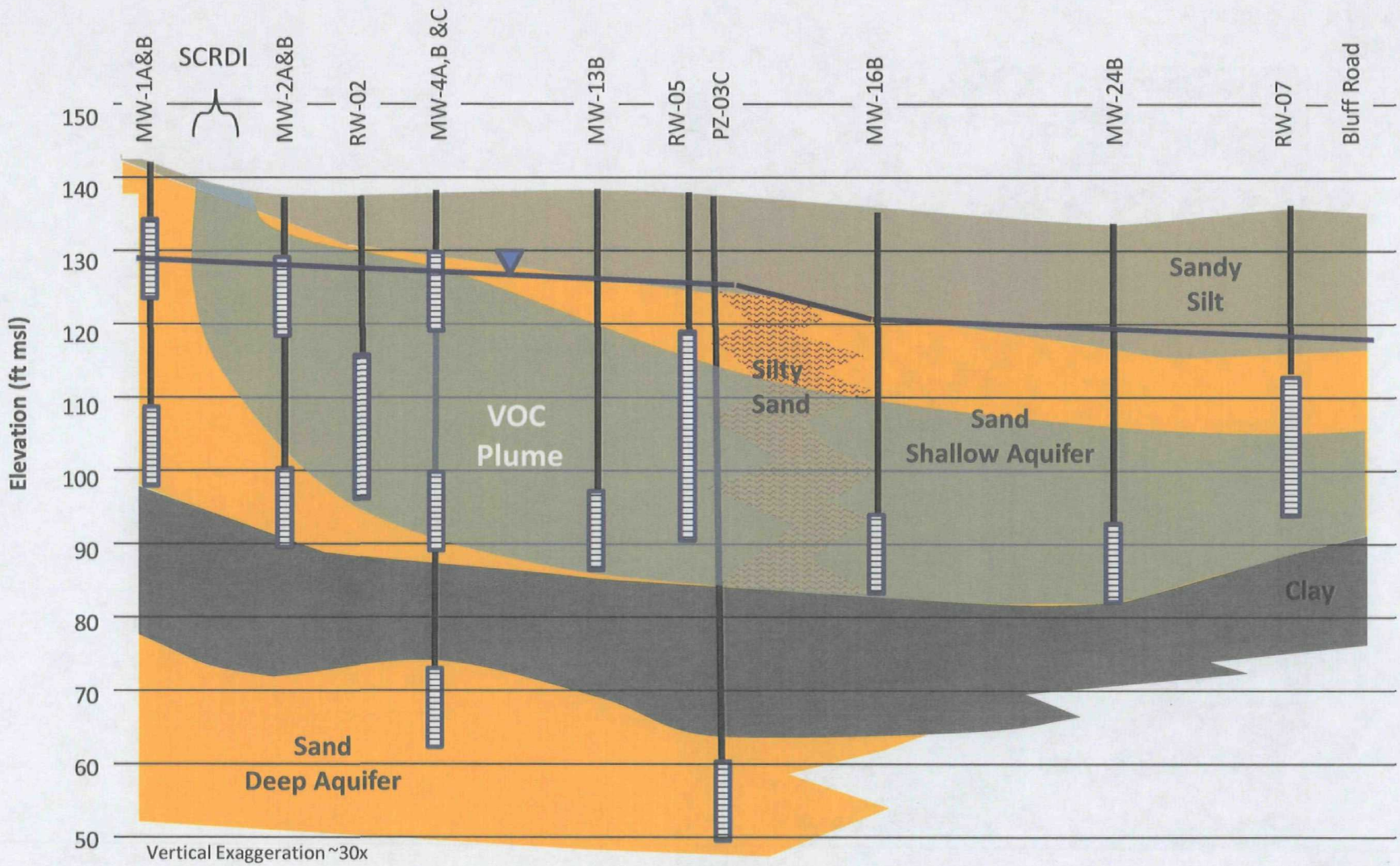


Figure 10
Cross Section Showing the VOC Plume
SCRDI Bluff Road
Columbia, South Carolina

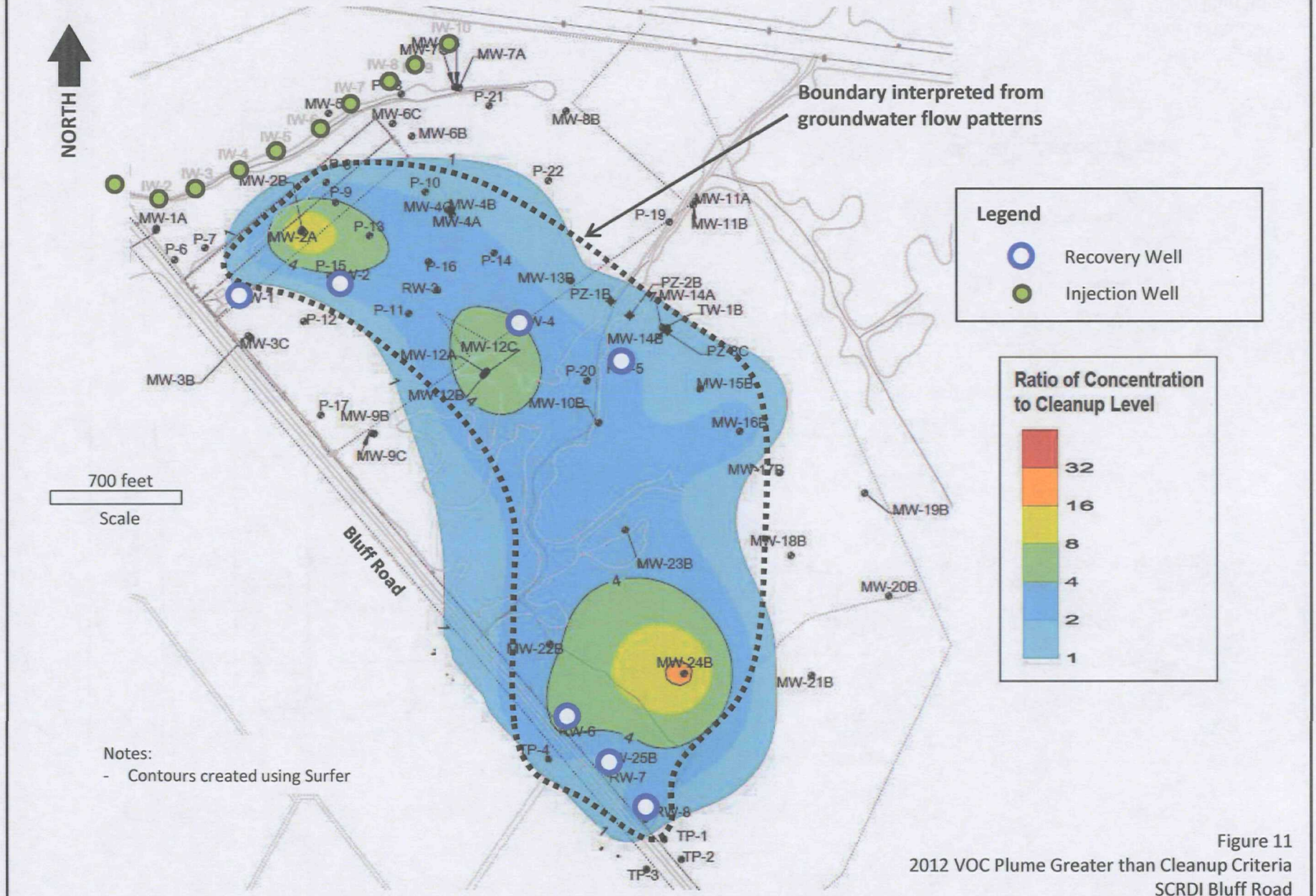


Figure 11
2012 VOC Plume Greater than Cleanup Criteria
SCRDI Bluff Road
Columbia, South Carolina

Services Environmental, Inc.

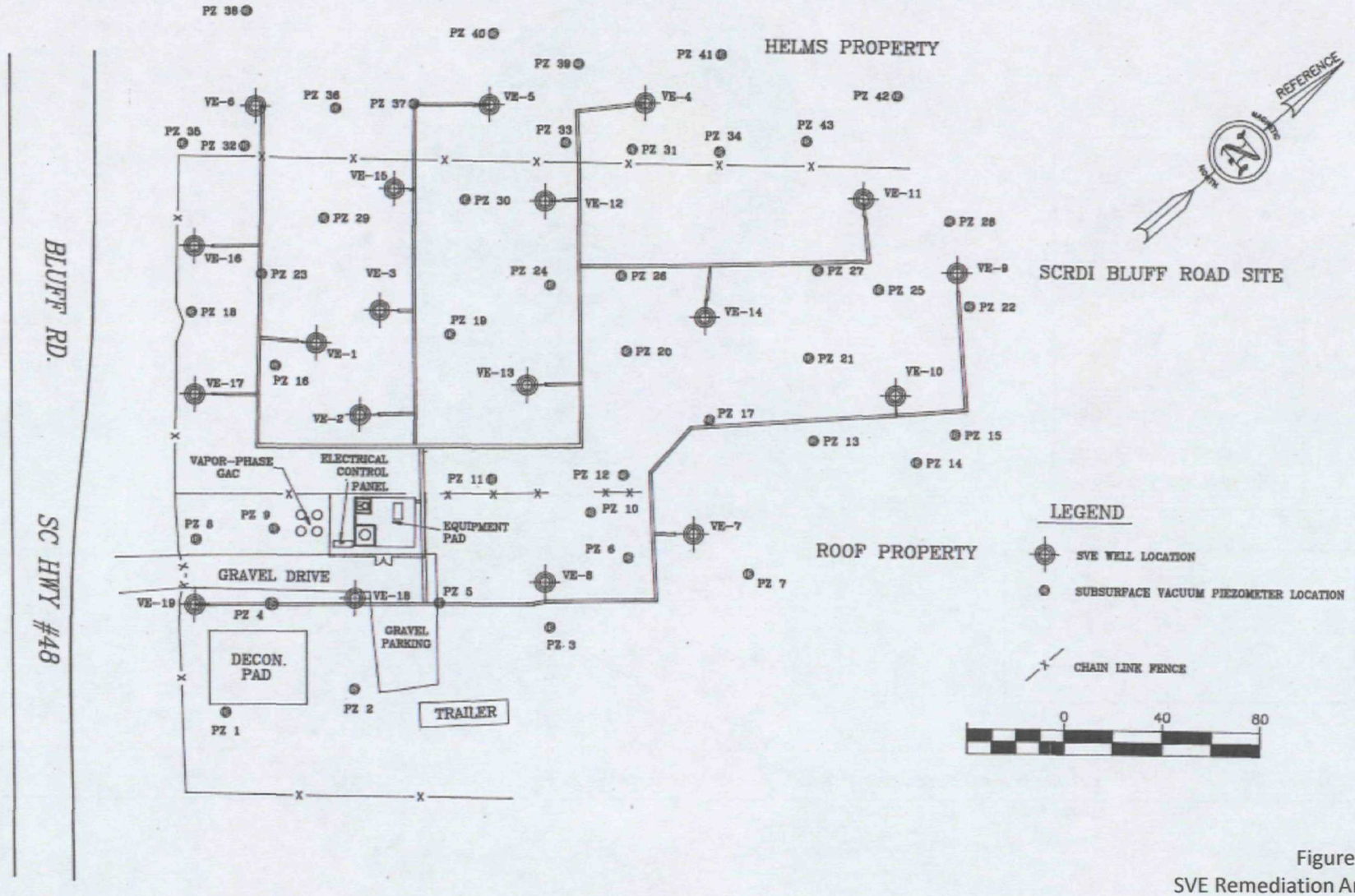
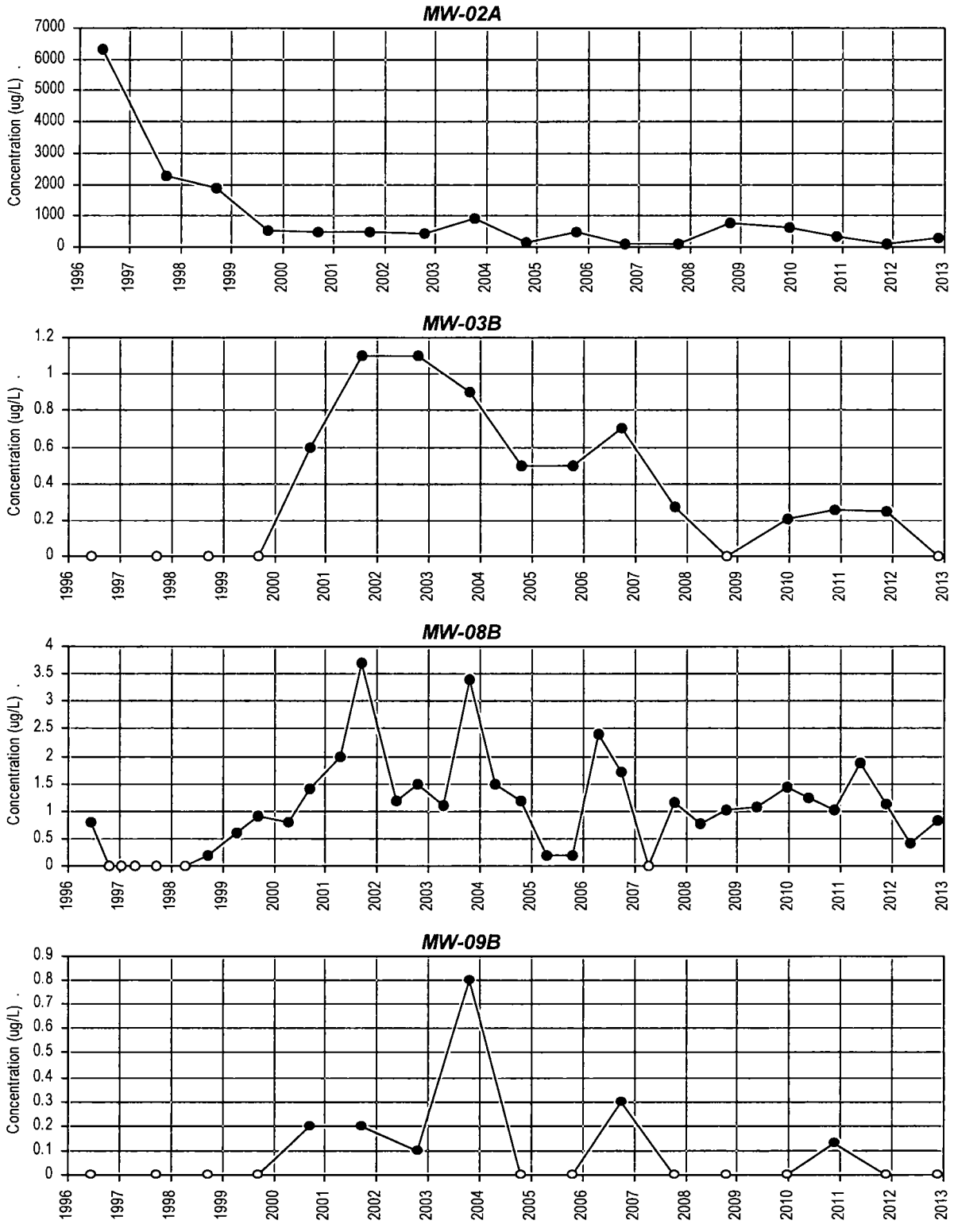


Figure 12
SVE Remediation Area
SCRDI Bluff Road
Columbia, South Carolina

Attachment B

Total VOCs versus Time Graphs

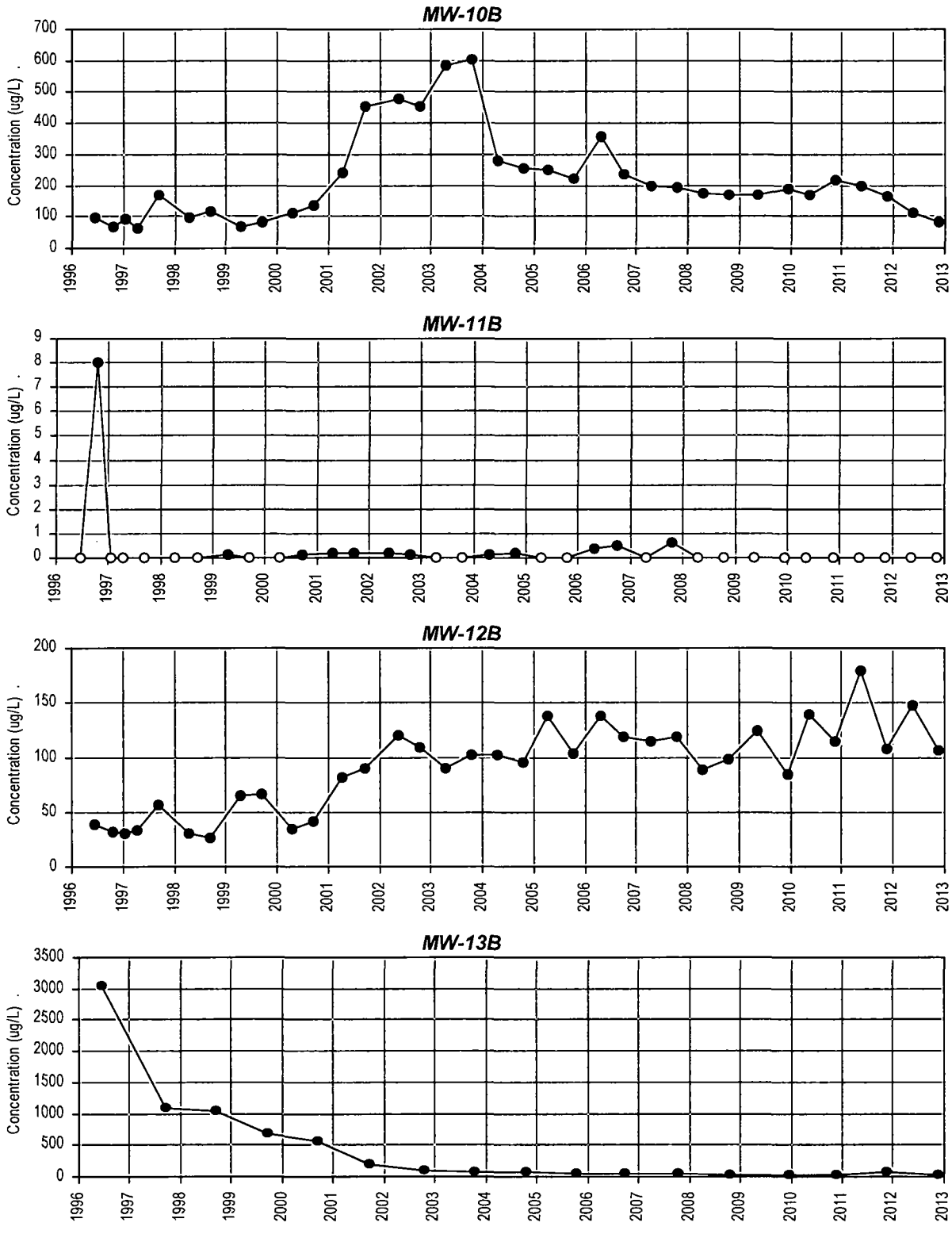
Total VOCs in Ground Water
SCRDI Bluff Road Site



Notes: Open dots indicate all non-detect results.
Acetone is not included in the Total VOC calculation.

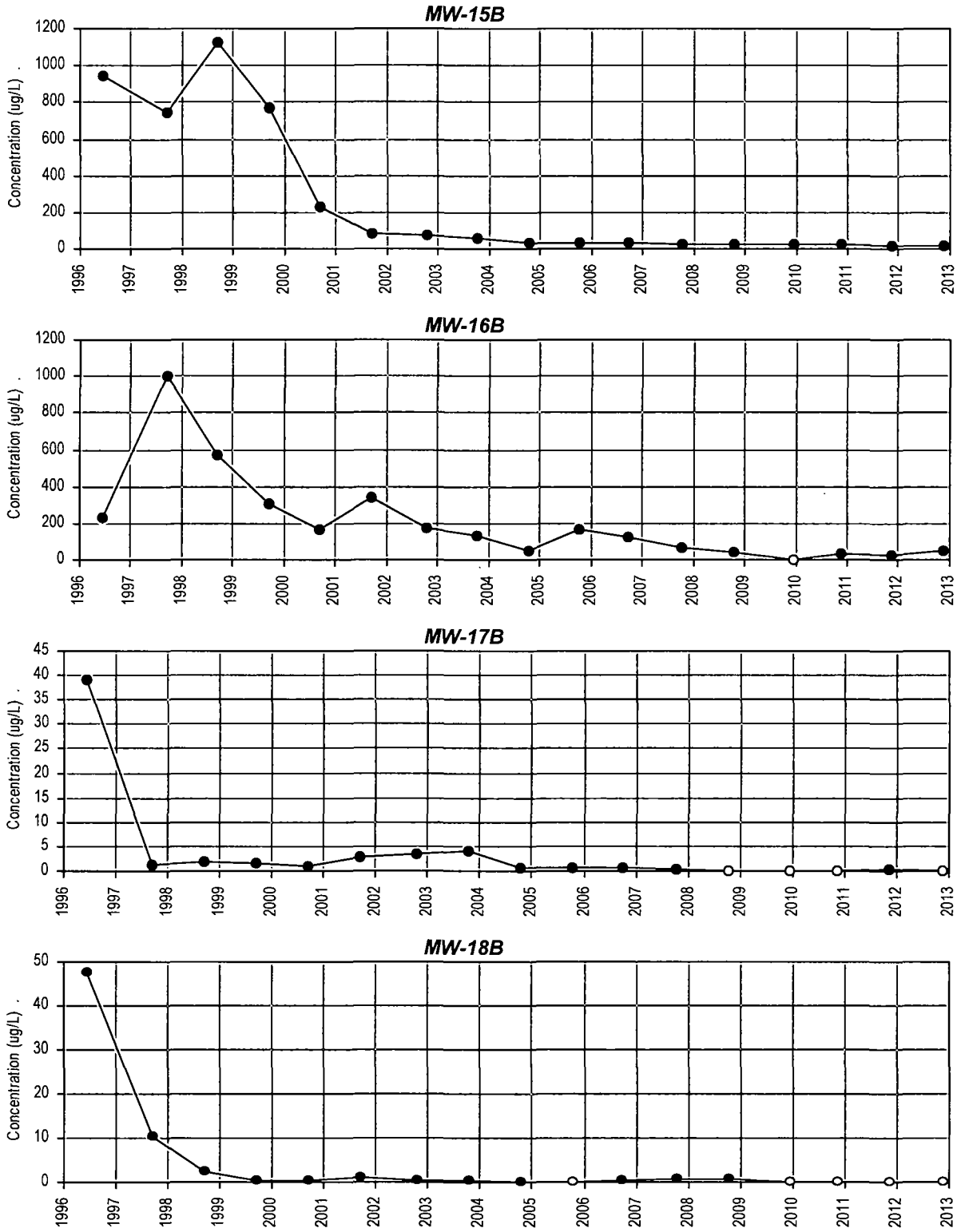
Services Environmental, Inc.

Total VOCs in Ground Water
SCRDI Bluff Road Site



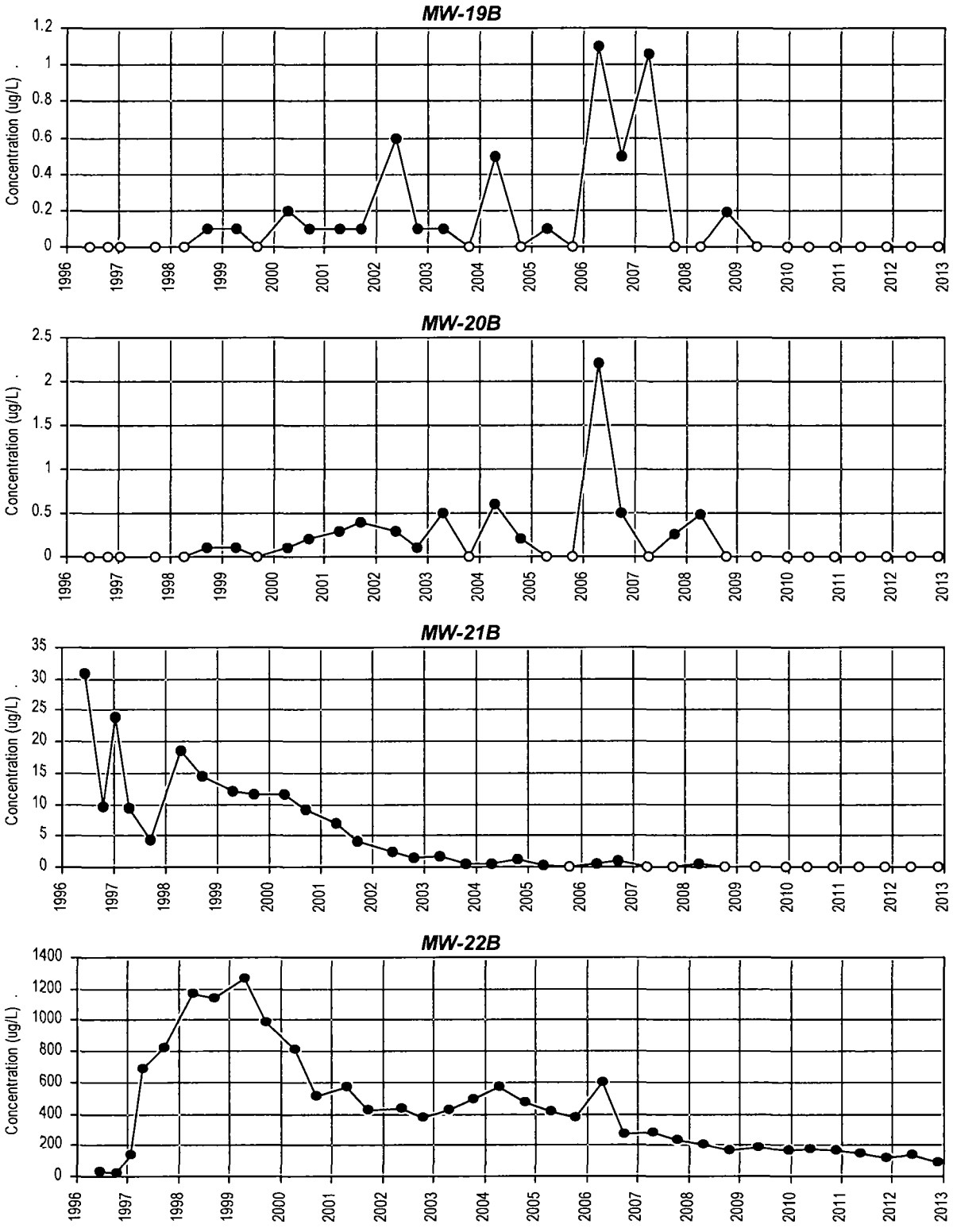
Notes: Open dots indicate all non-detect results.
Acetone is not included in the Total VOC calculation.

Total VOCs in Ground Water
SCRDI Bluff Road Site



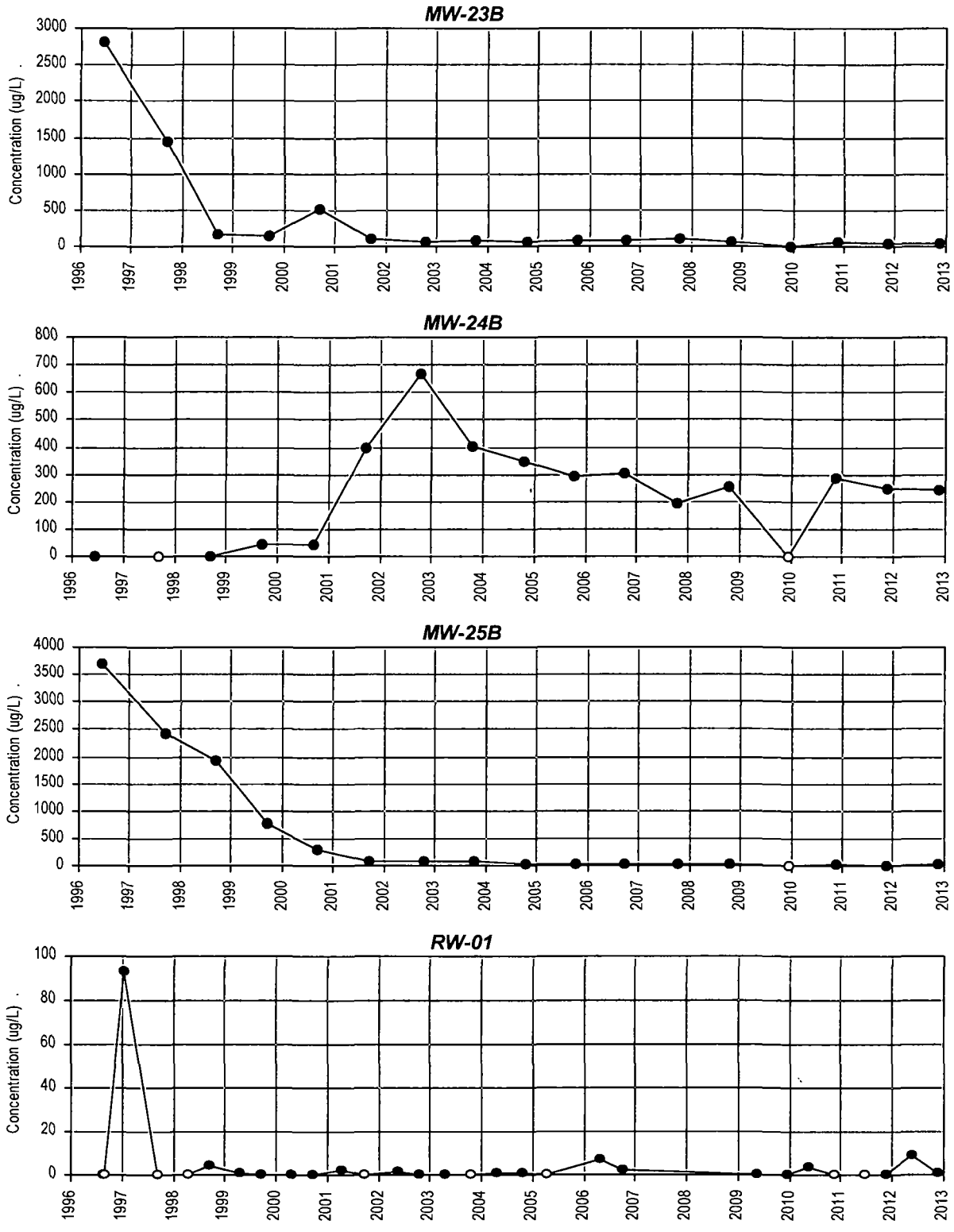
Notes: Open dots indicate all non-detect results.
Acetone is not included in the Total VOC calculation.

Total VOCs in Ground Water
SCRDI Bluff Road Site



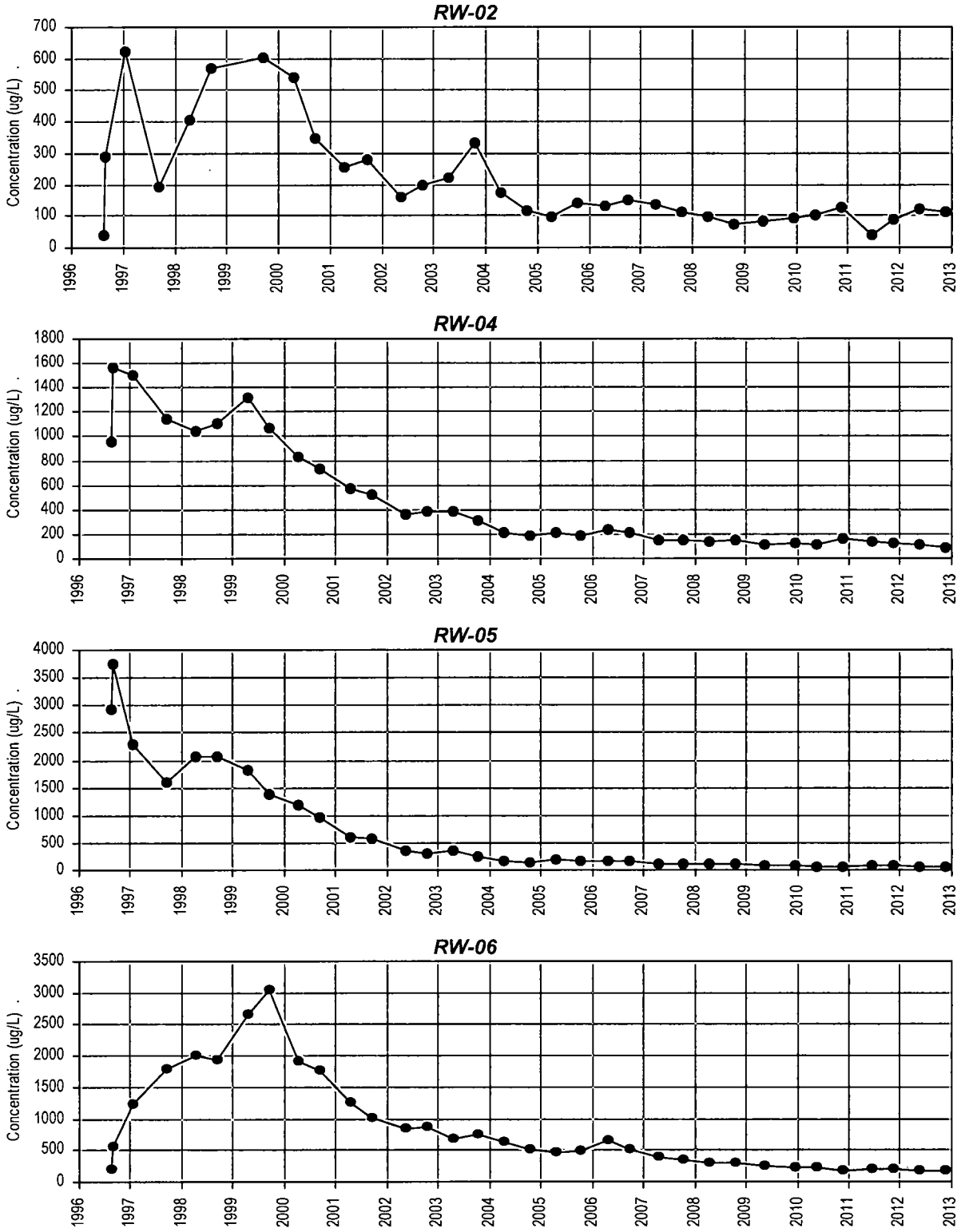
Notes: Open dots indicate all non-detect results.
Acetone is not included in the Total VOC calculation.

Total VOCs in Ground Water
SCRDI Bluff Road Site



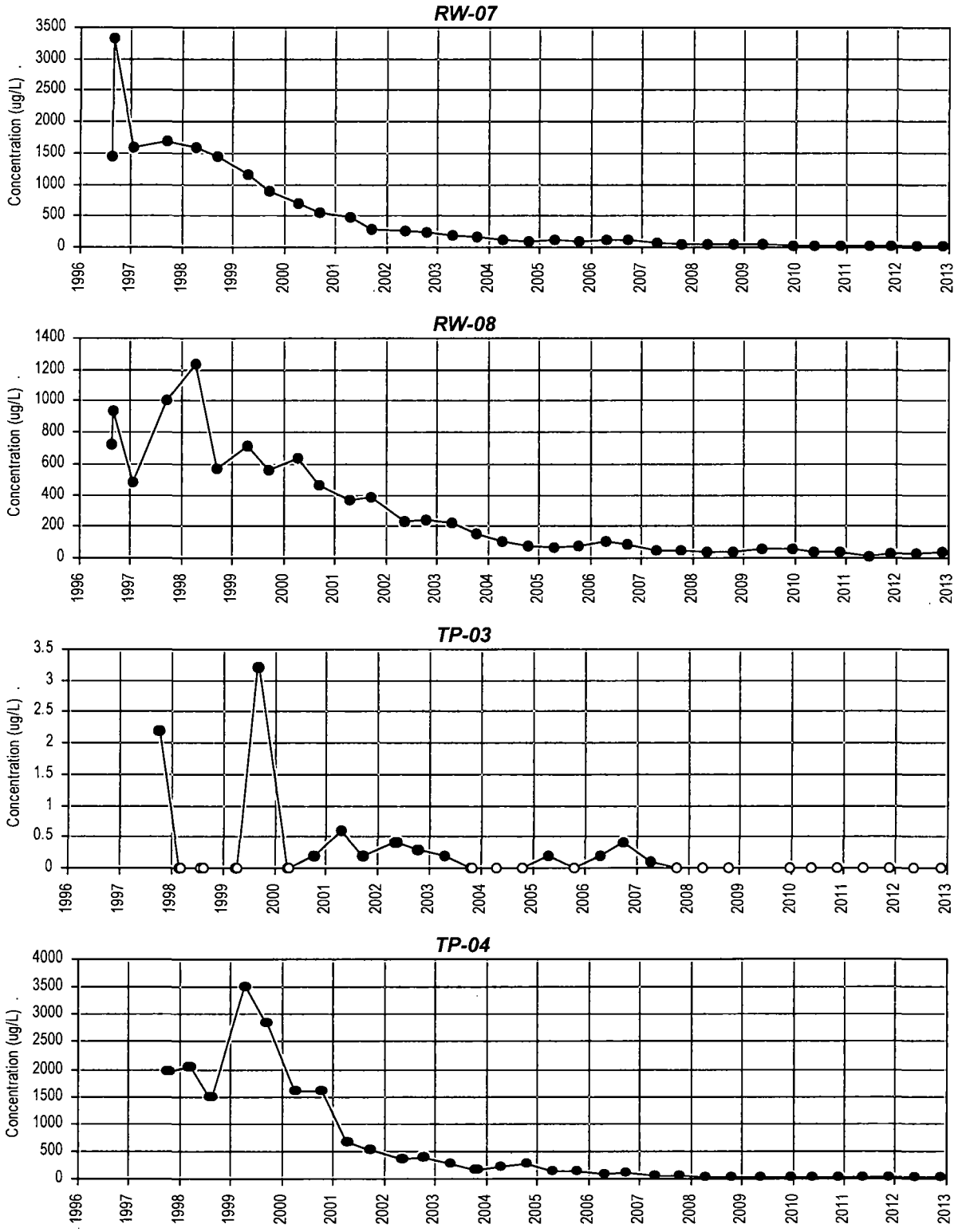
Notes: Open dots indicate all non-detect results.
Acetone is not included in the Total VOC calculation.

Total VOCs in Ground Water
SCRDI Bluff Road Site



Notes: Open dots indicate all non-detect results.
Acetone is not included in the Total VOC calculation.

Total VOCs in Ground Water
SCRDI Bluff Road Site

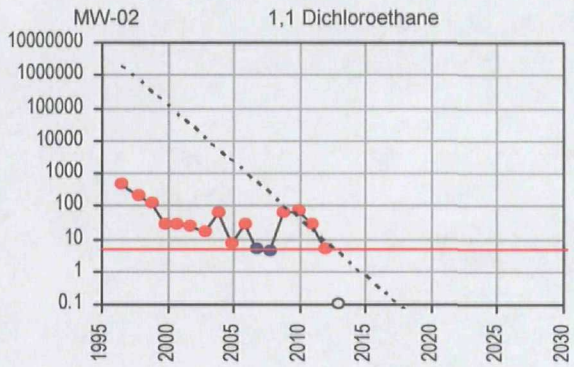


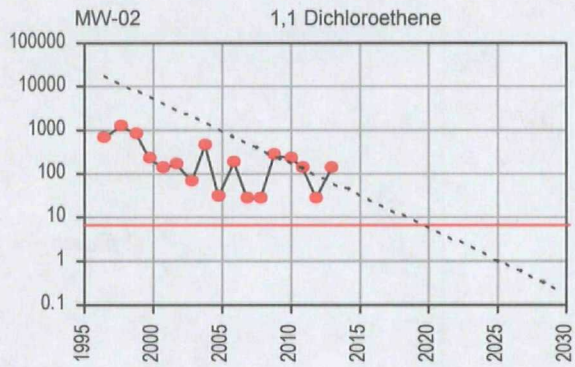
Notes: Open dots indicate all non-detect results.
Acetone is not included in the Total VOC calculation.

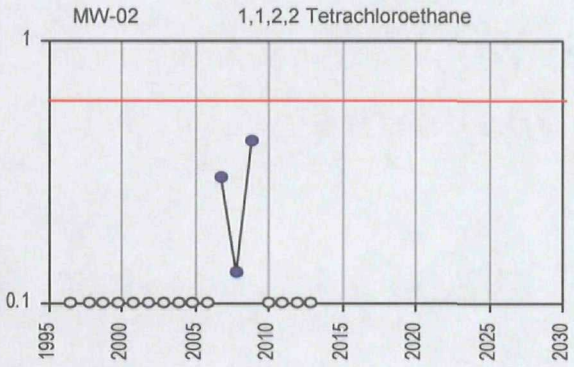
Attachment C

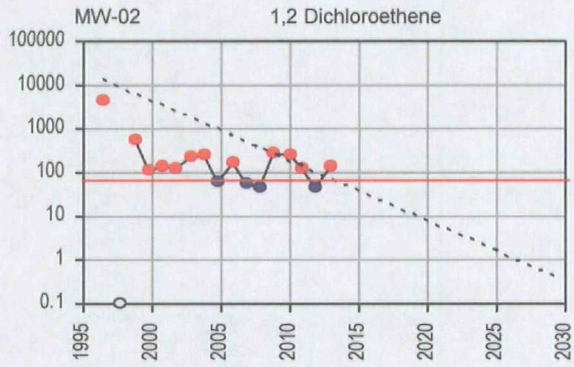
Concentration versus Time Graphs for Individual Compounds

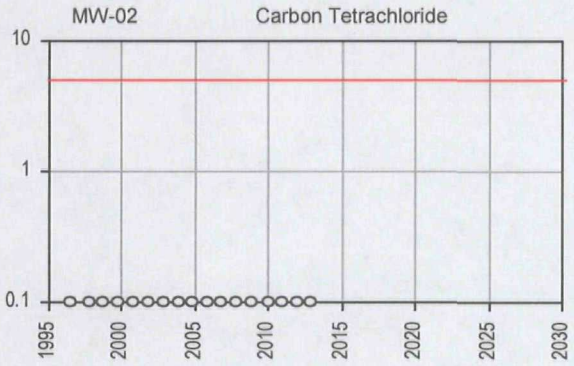
SCRDI Bluff Road - Concentration Trends for Select Parameters

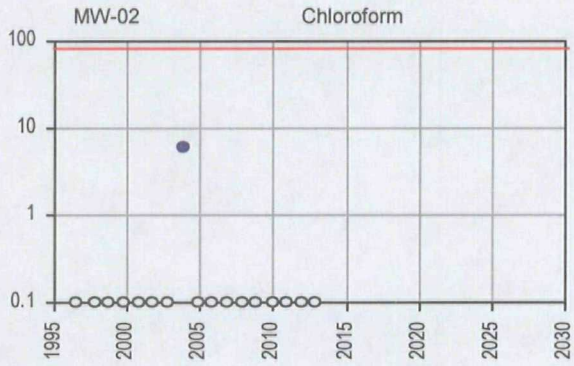


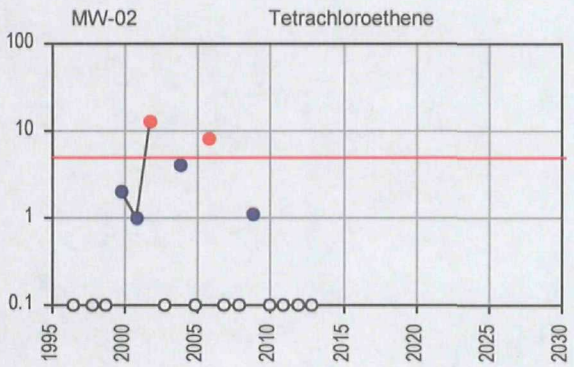


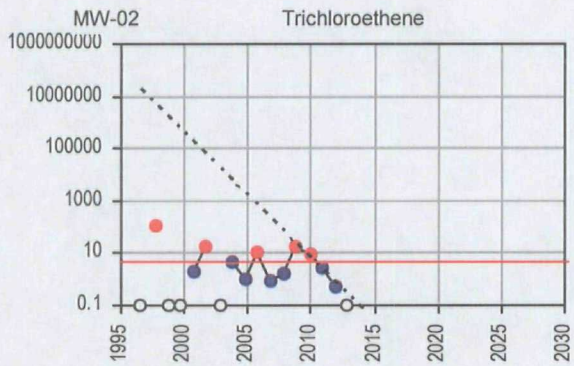












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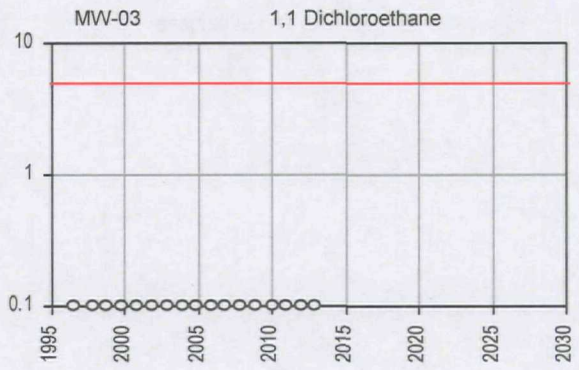
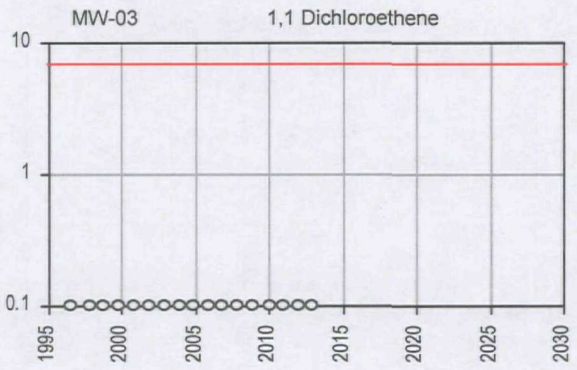
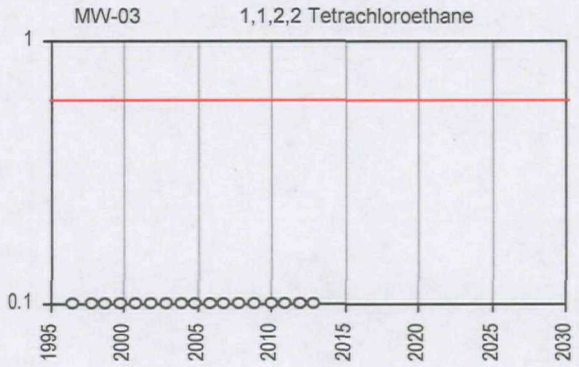
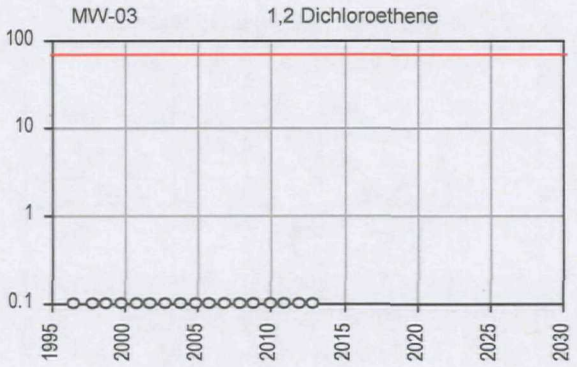
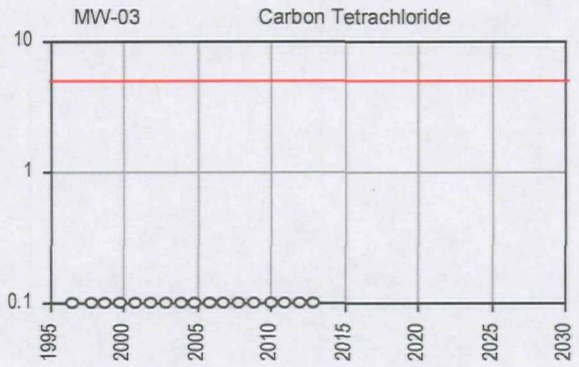
SCRDI Bluff Road - Concentration Trends for Select Parameters

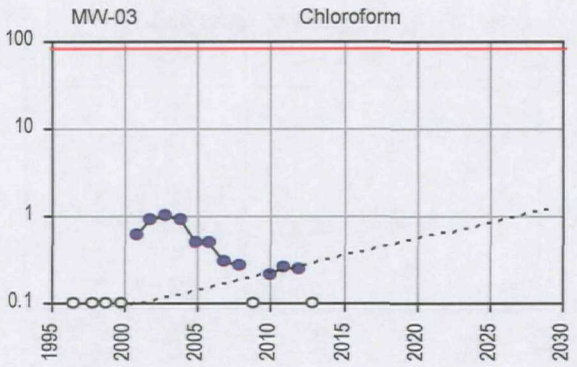


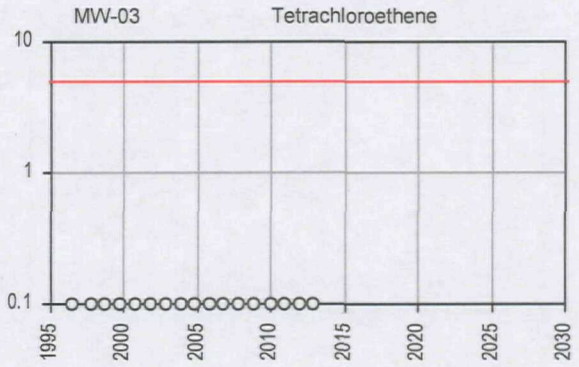


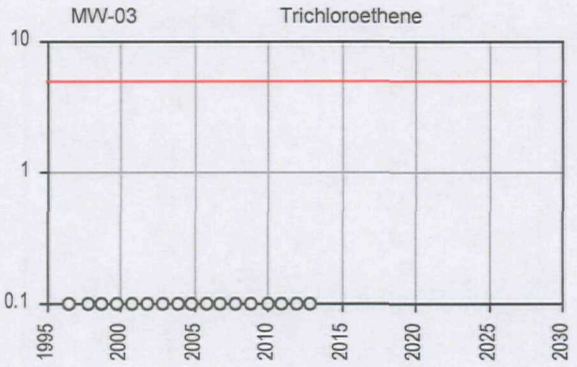












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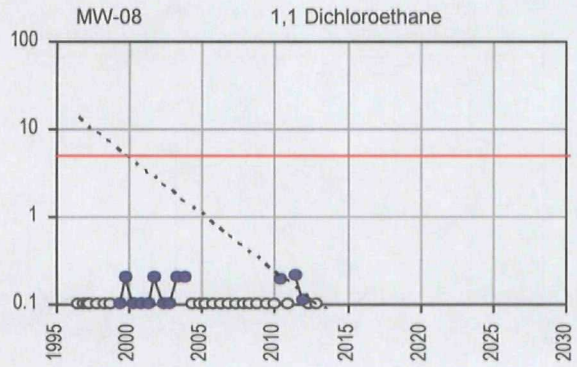
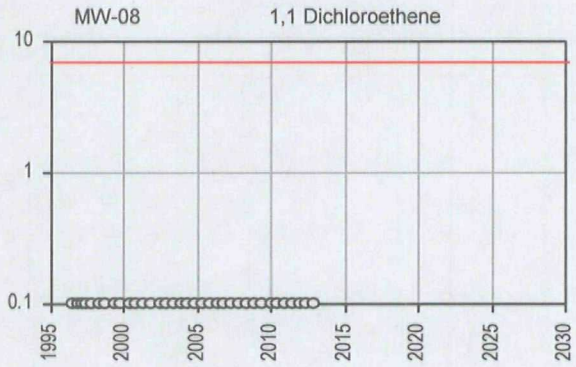
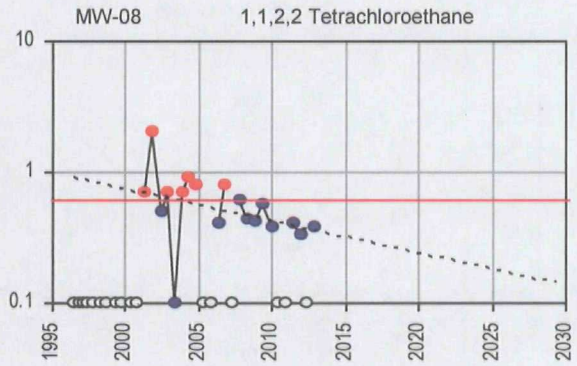
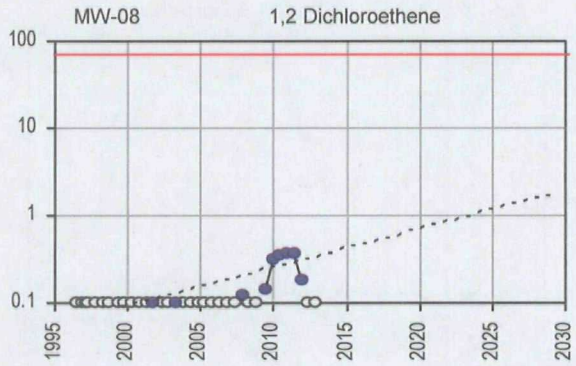
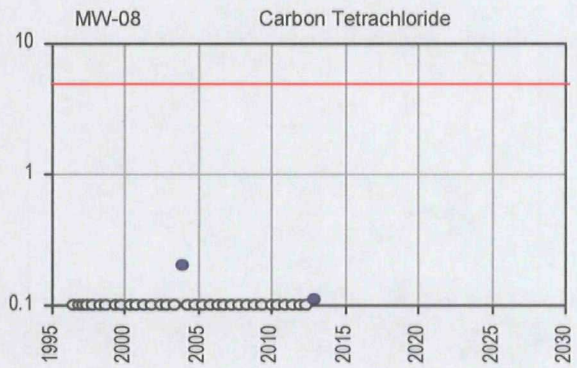
SCRDI Bluff Road - Concentration Trends for Select Parameters

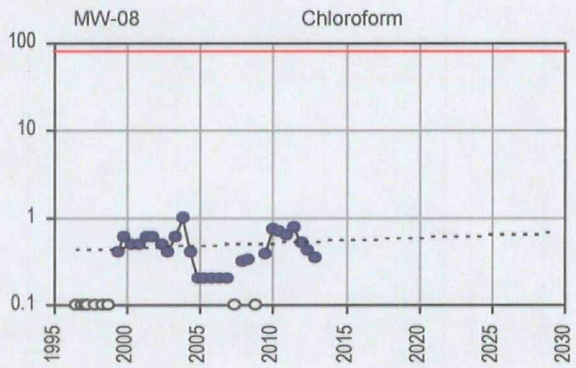


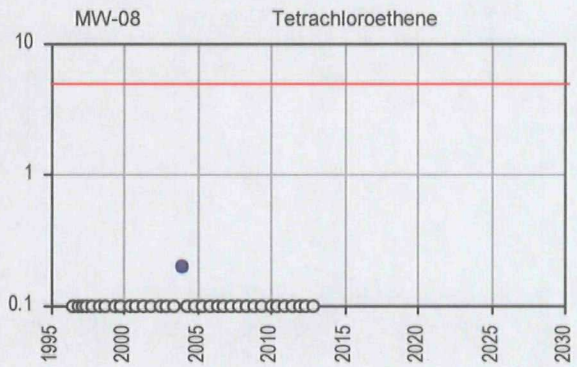


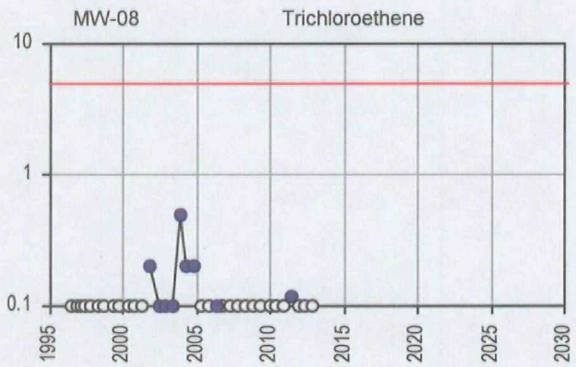












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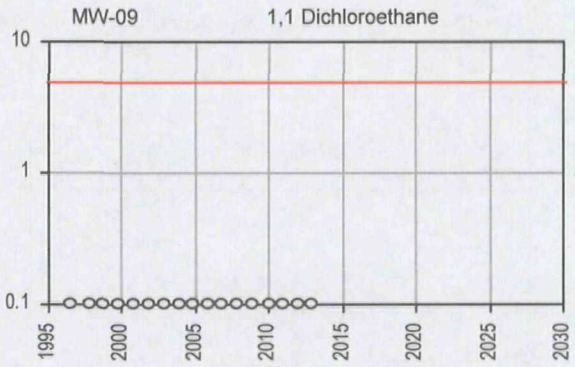
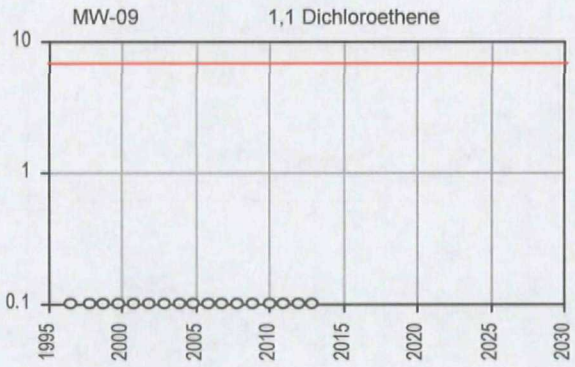
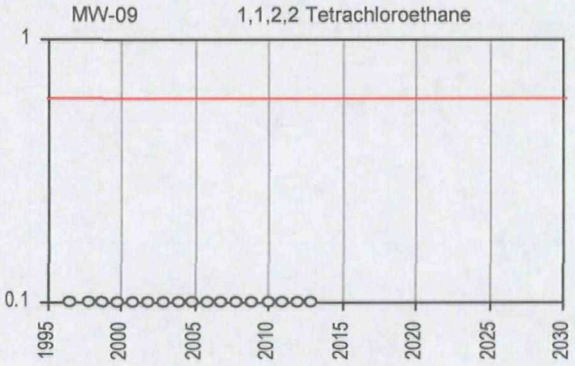
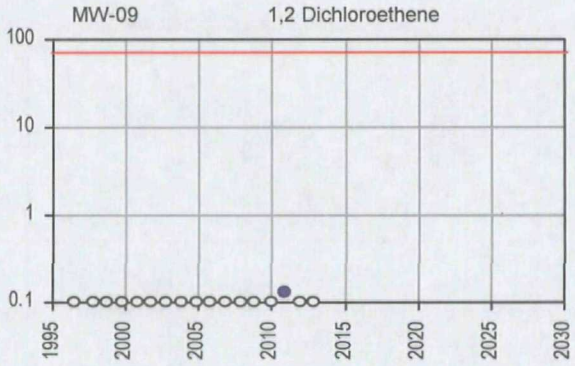
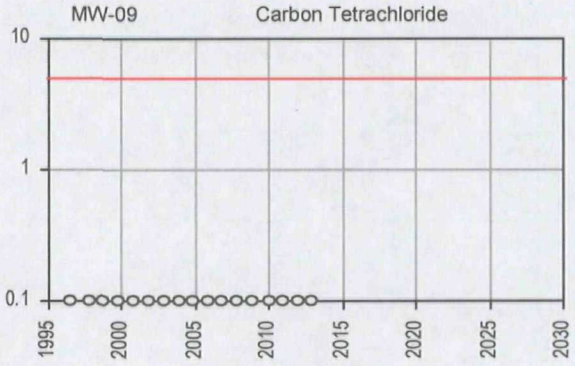
SCRDI Bluff Road - Concentration Trends for Select Parameters

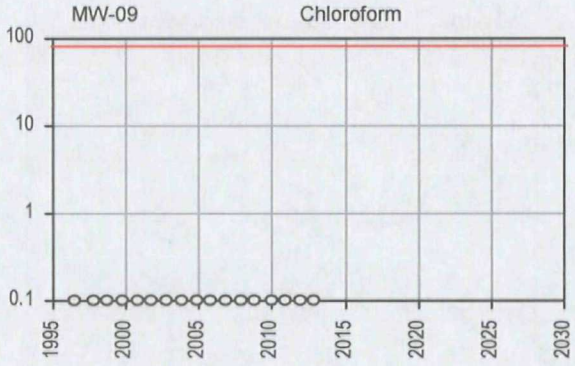


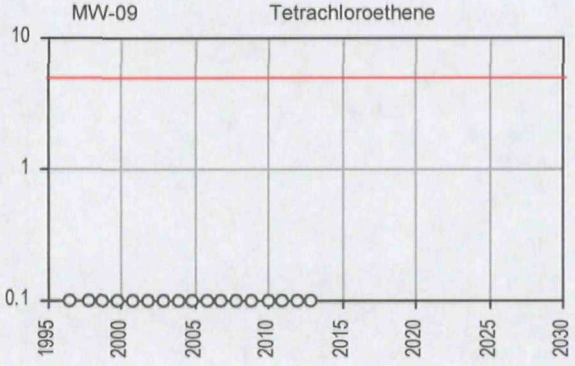


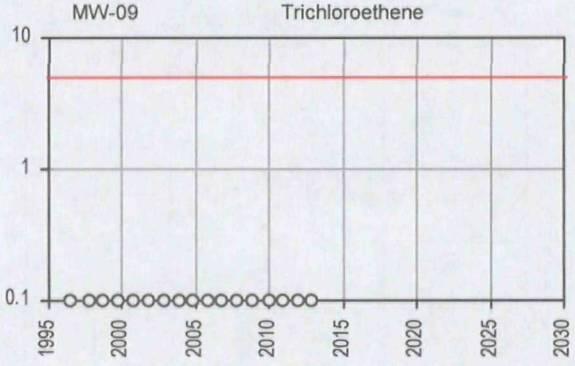












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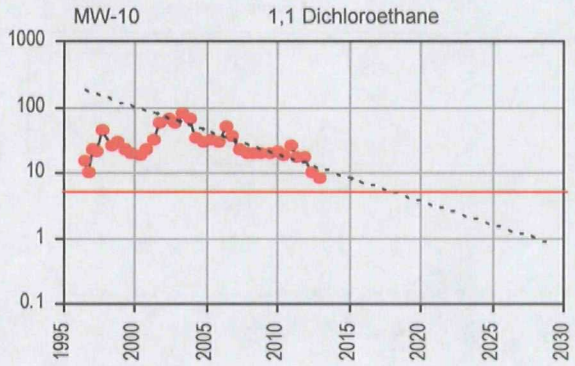
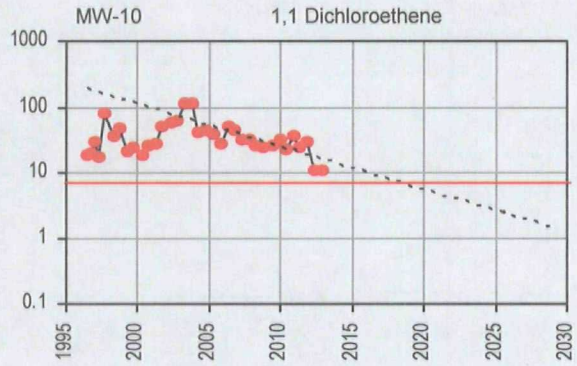
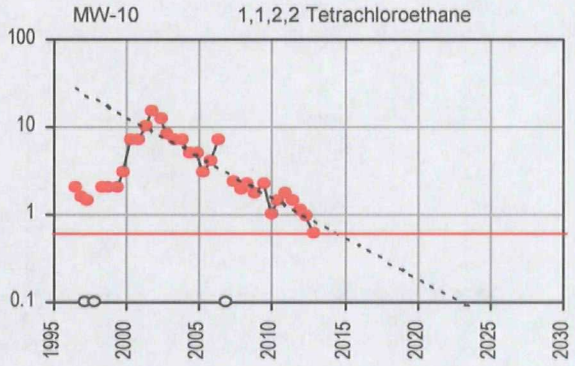
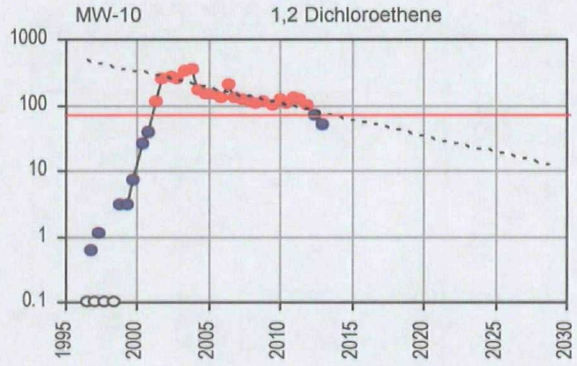
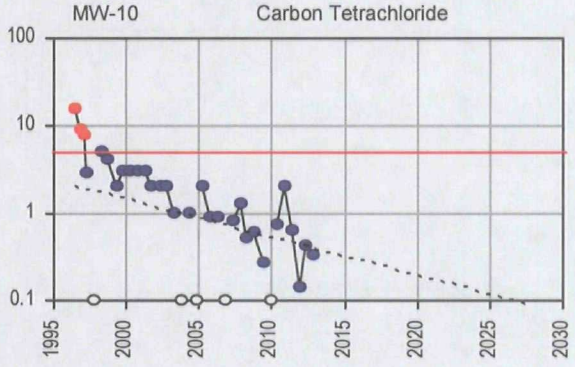
SCRDI Bluff Road - Concentration Trends for Select Parameters

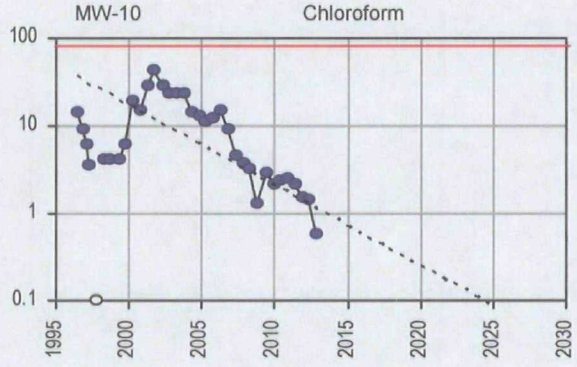


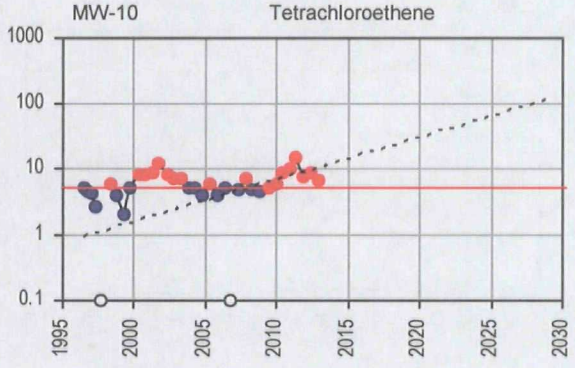


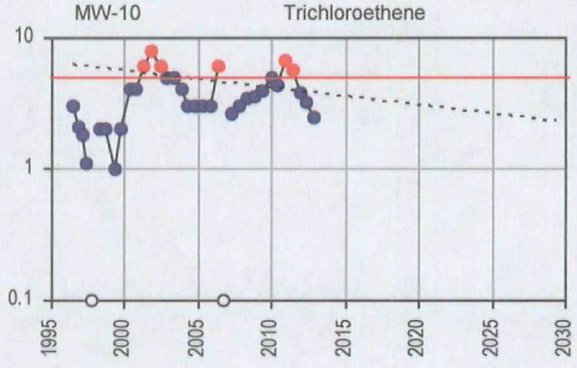












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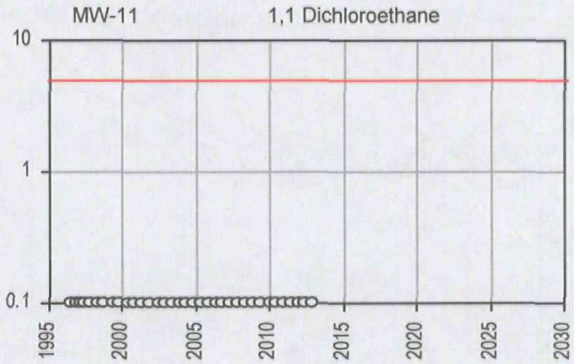
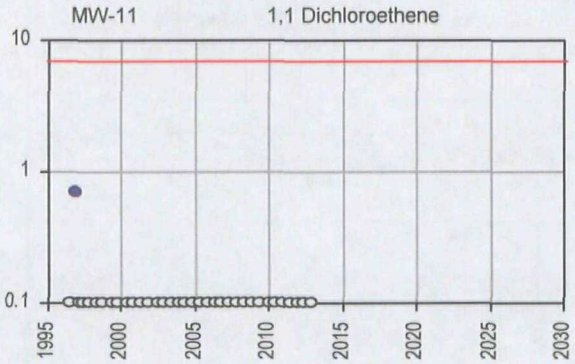
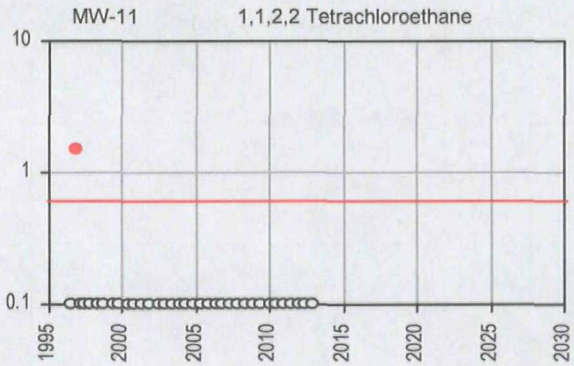
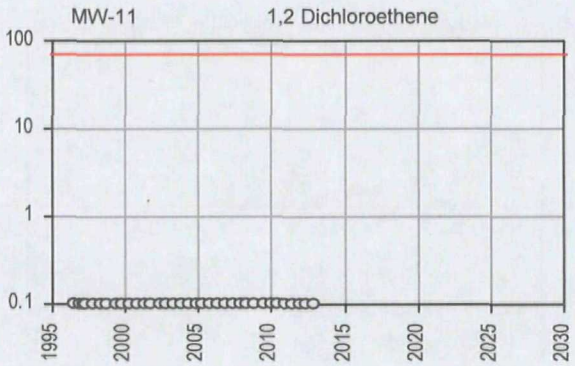
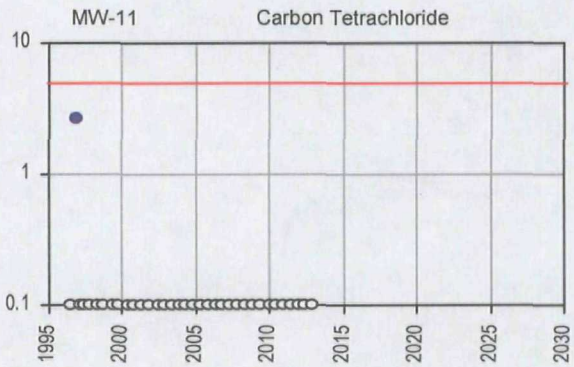
SCRDI Bluff Road - Concentration Trends for Select Parameters

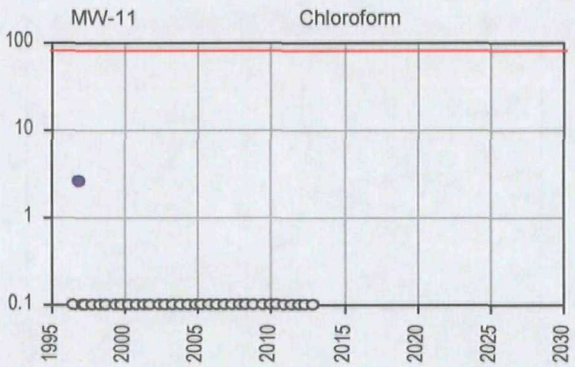


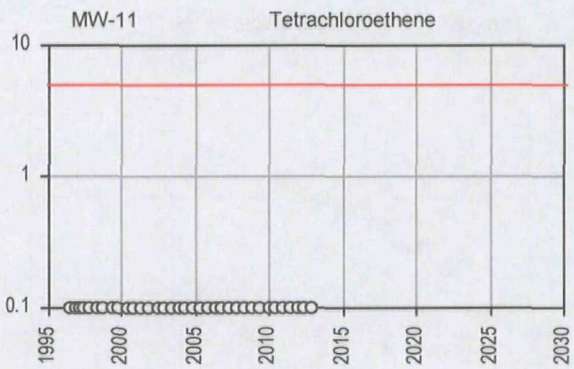


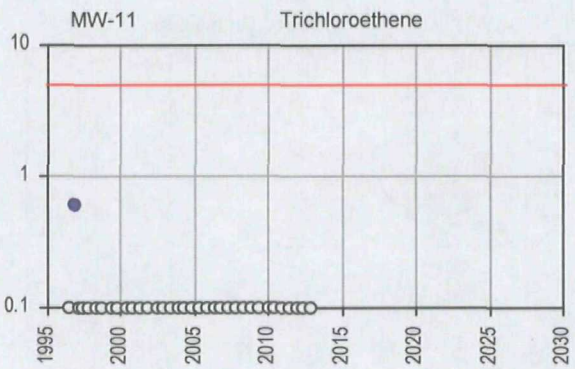












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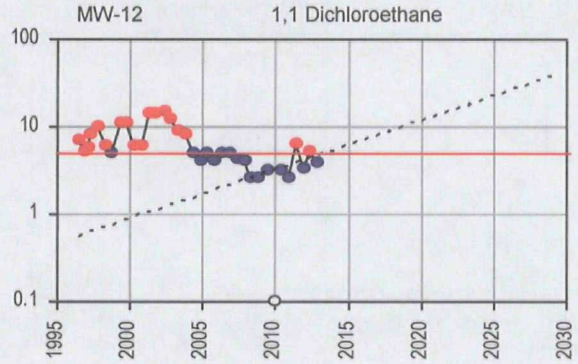
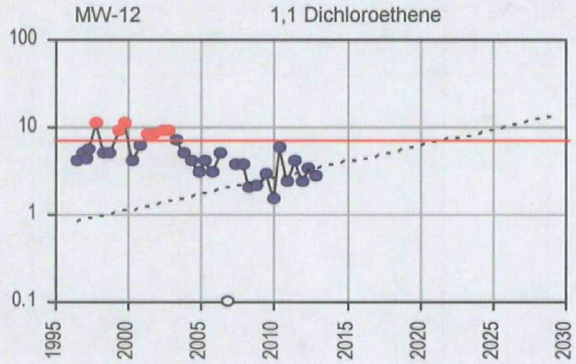
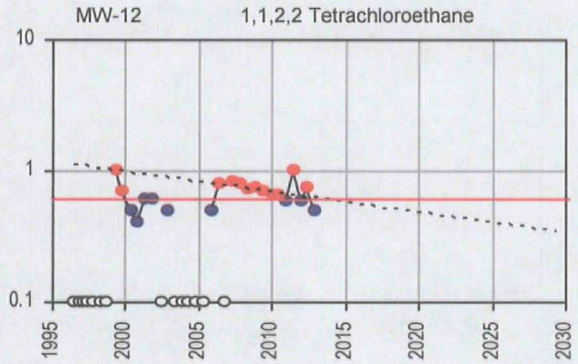
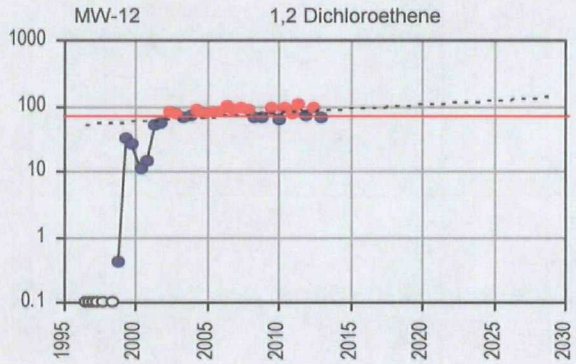
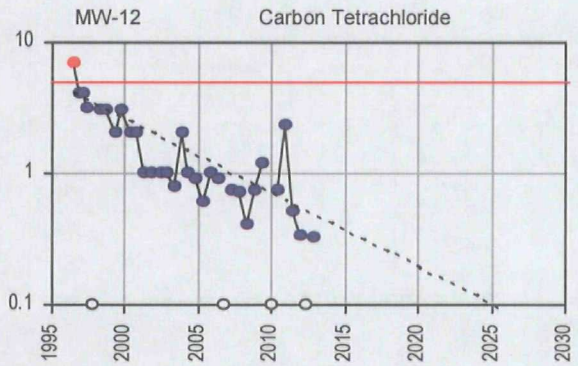
SCRDI Bluff Road - Concentration Trends for Select Parameters

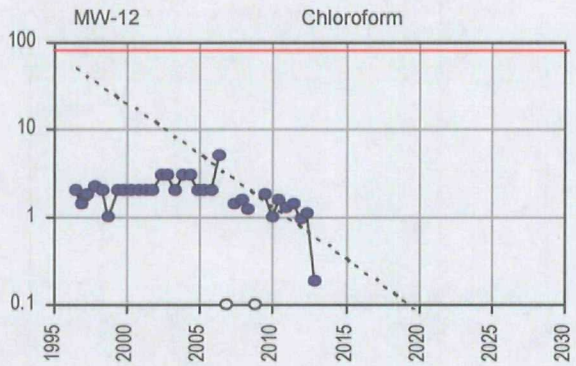


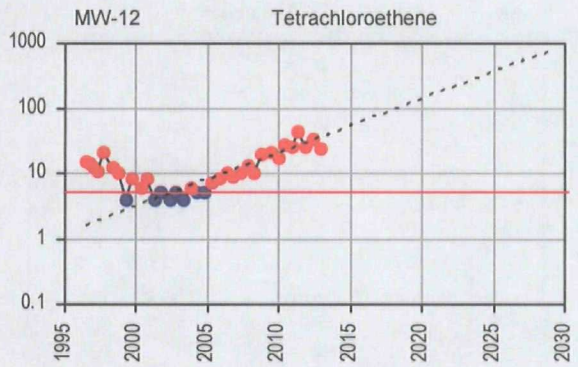


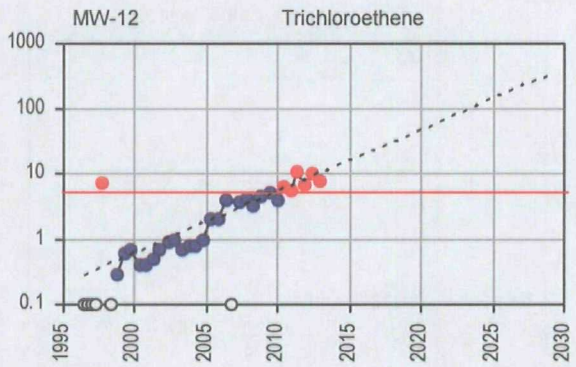












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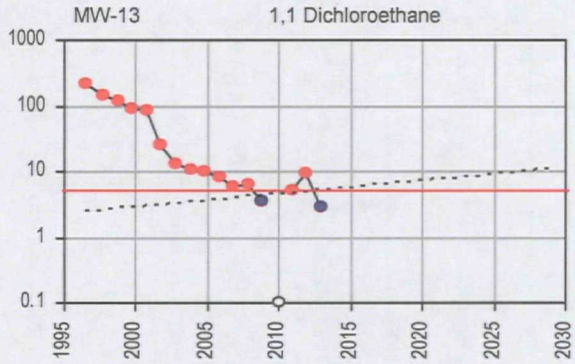

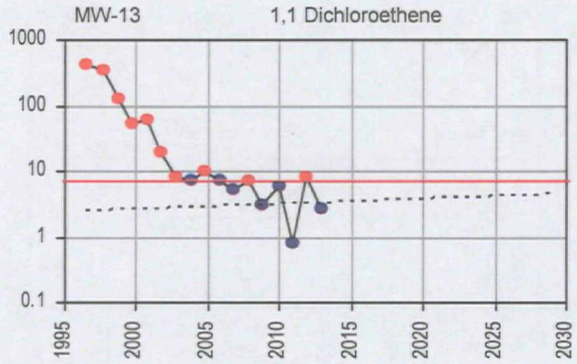

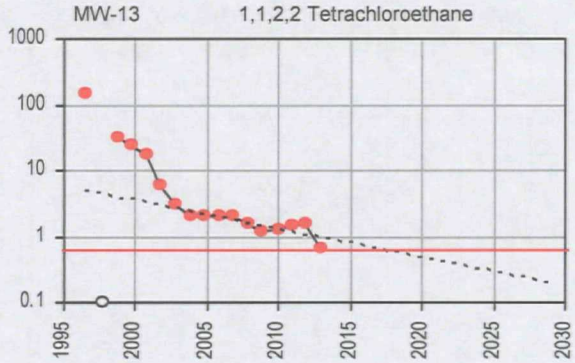

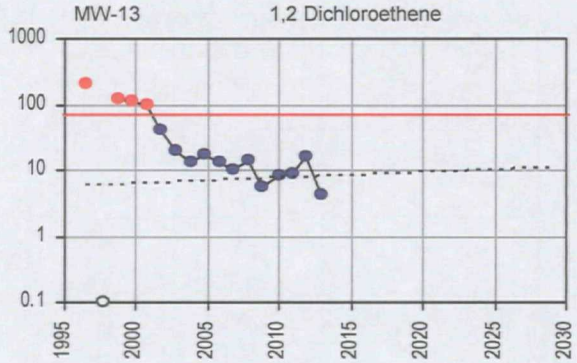

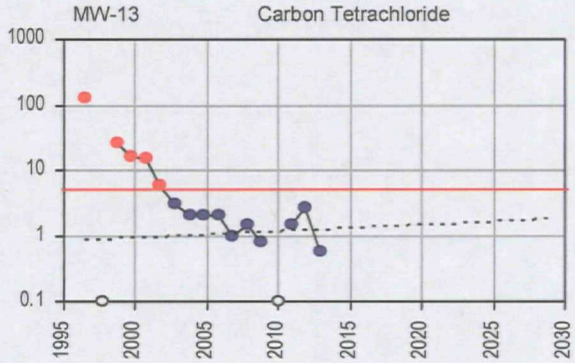

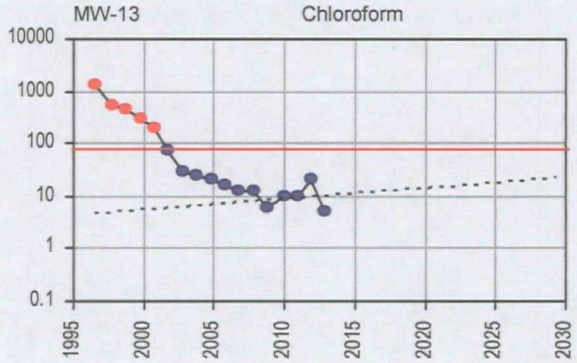

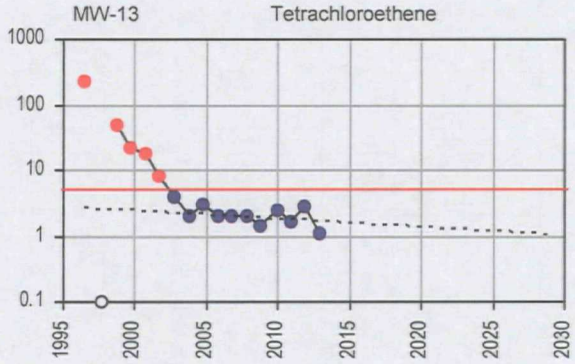

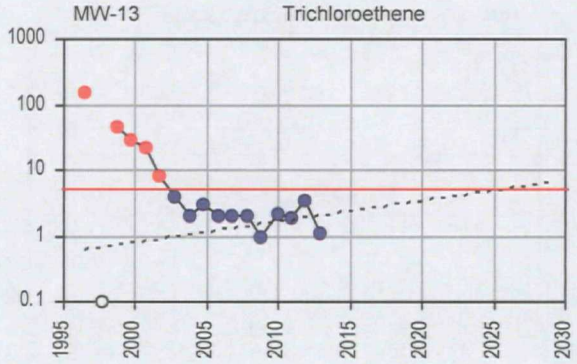

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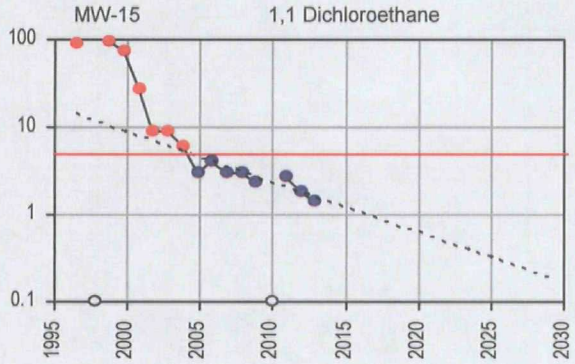

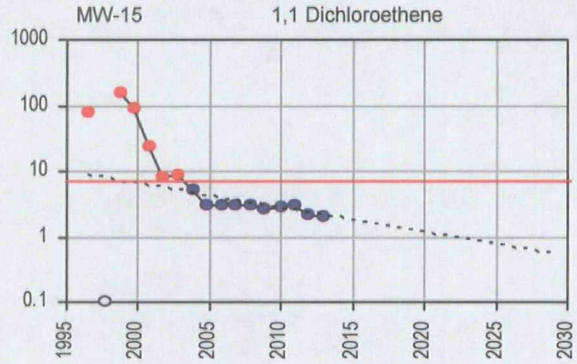

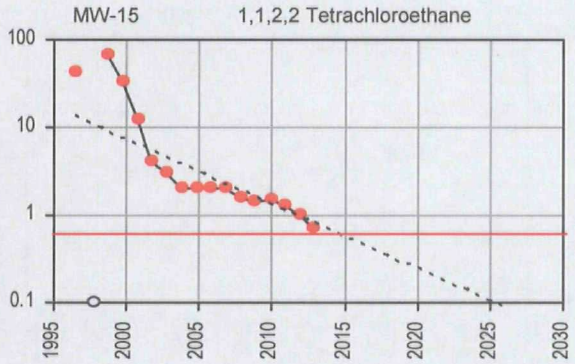

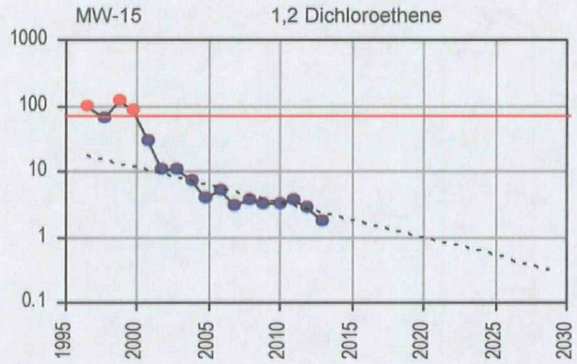

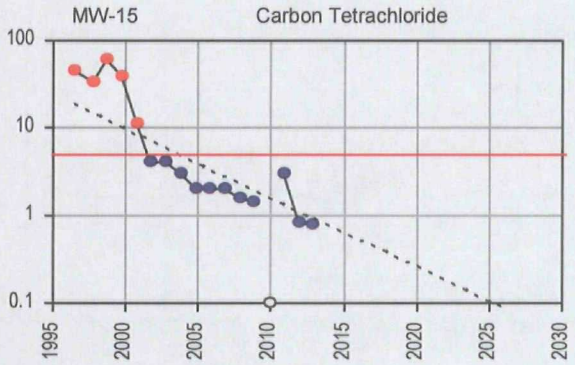

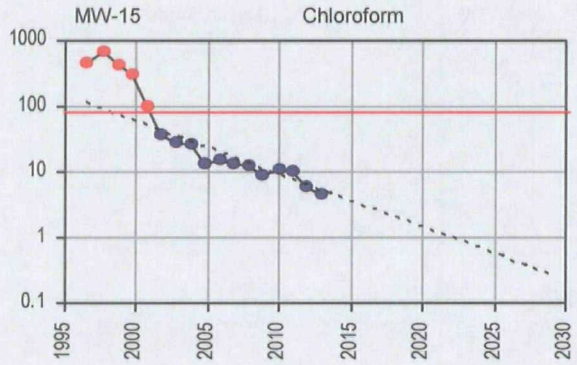

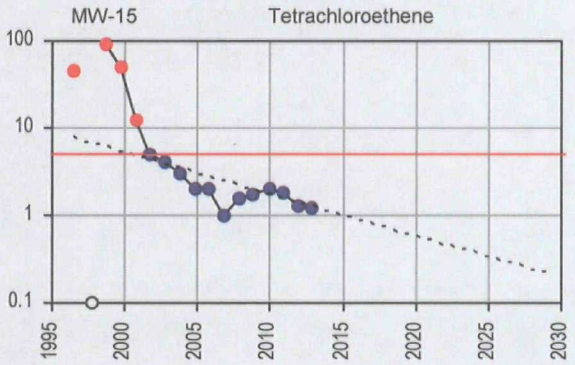

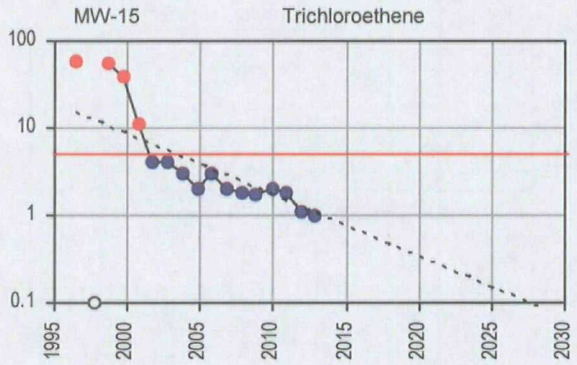

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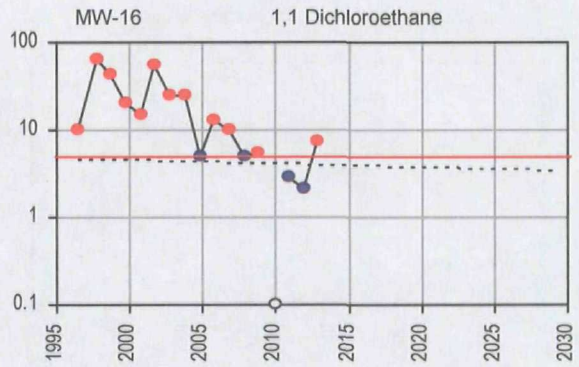

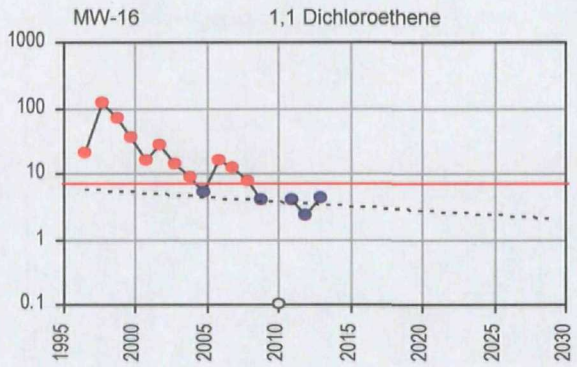

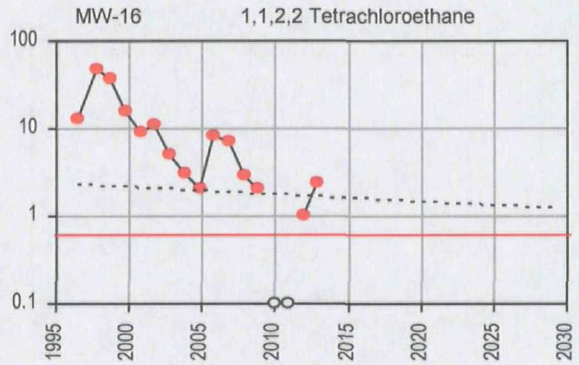

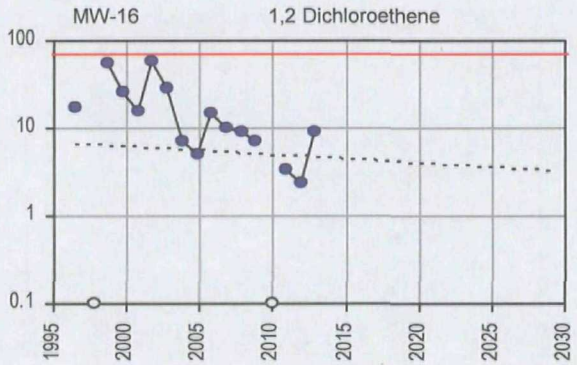

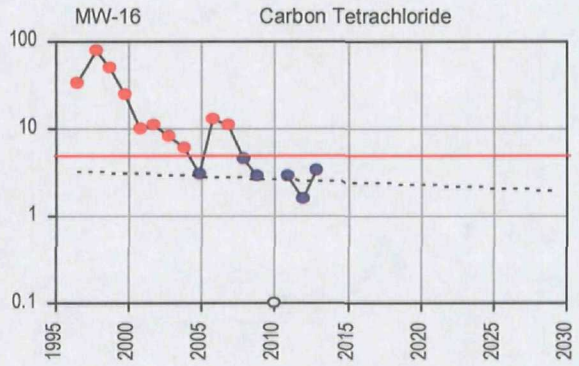

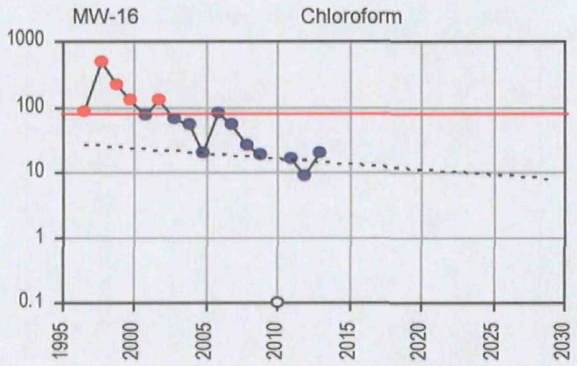

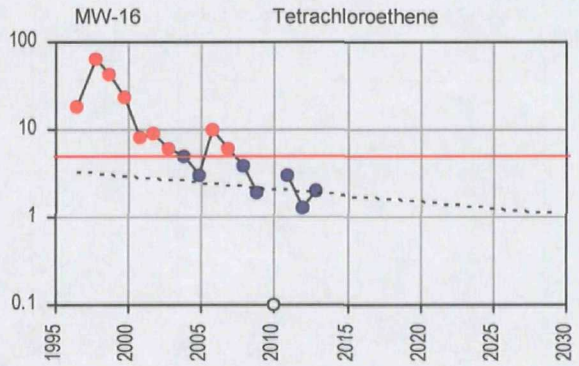

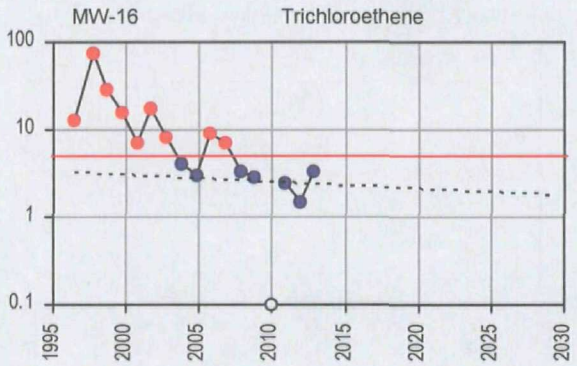

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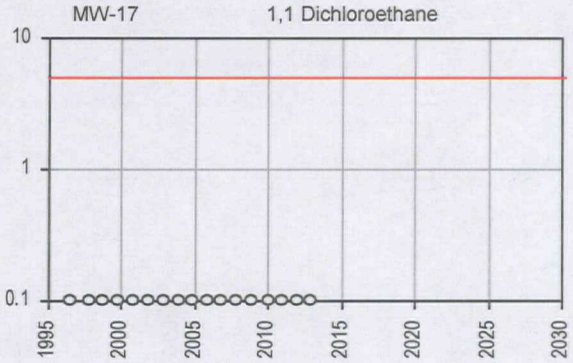

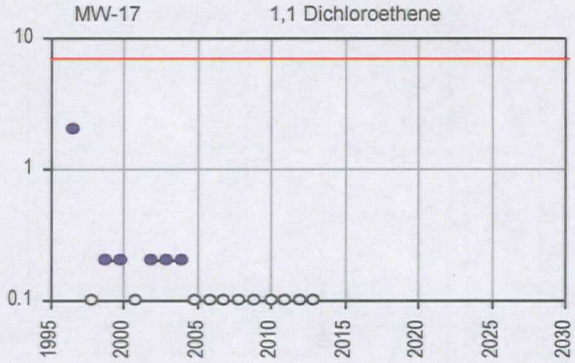

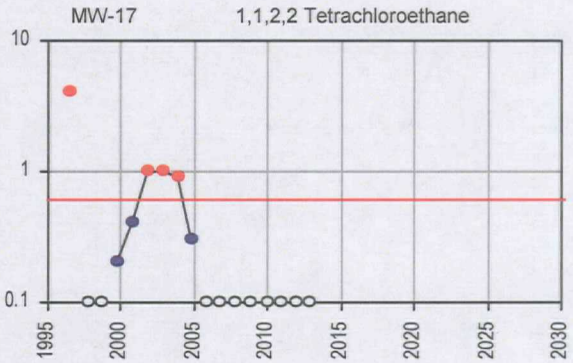

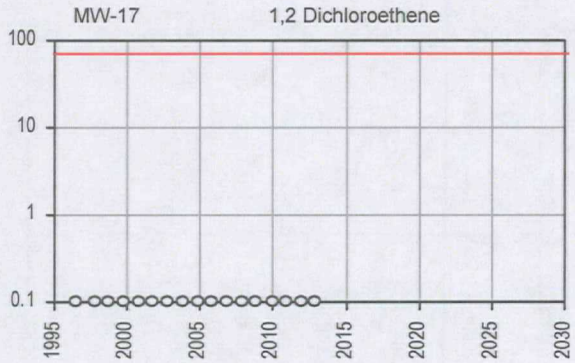

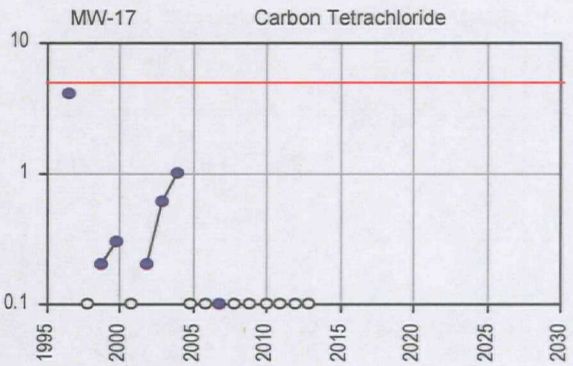

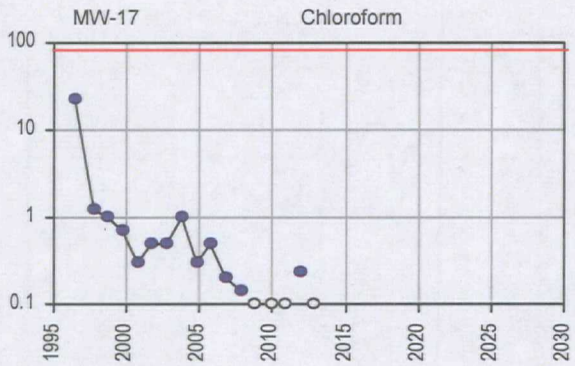

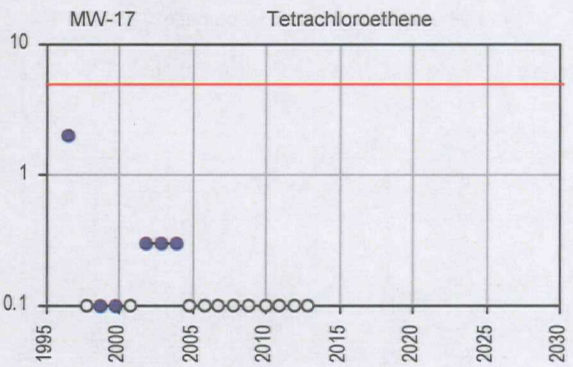

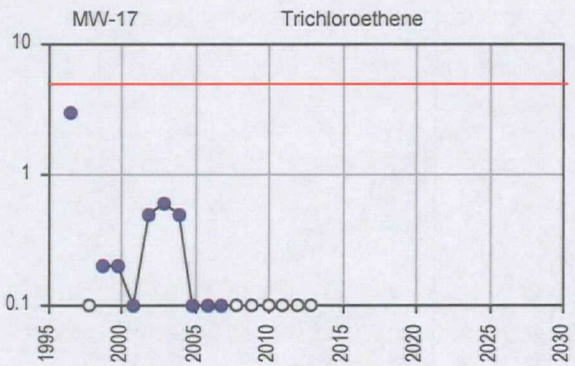

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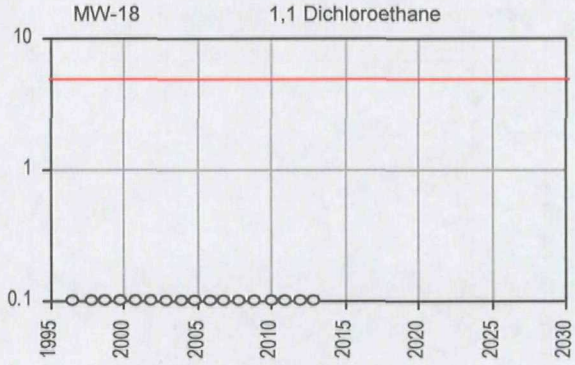

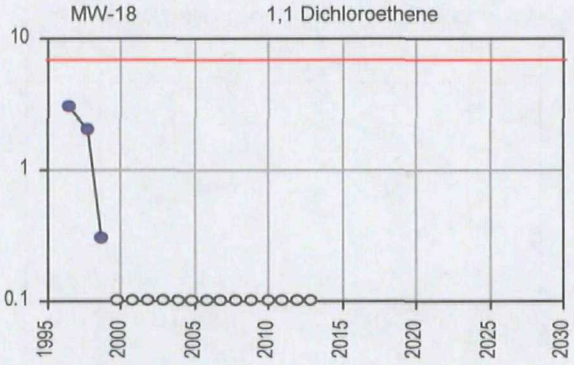

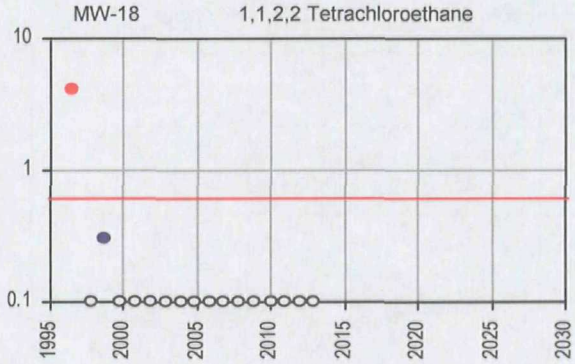

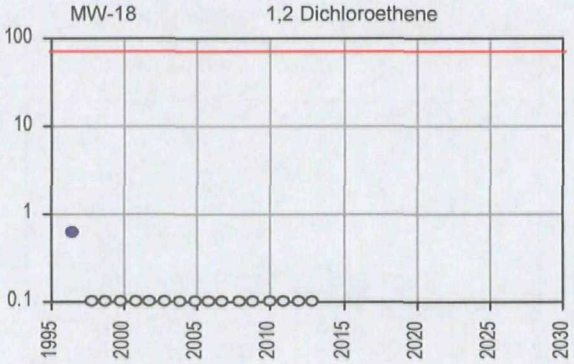

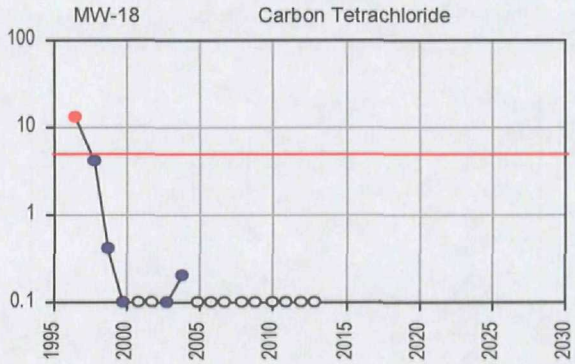

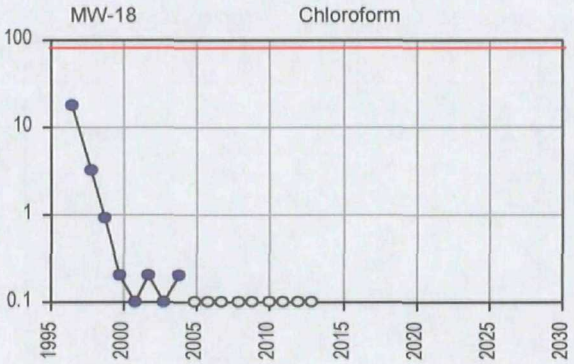

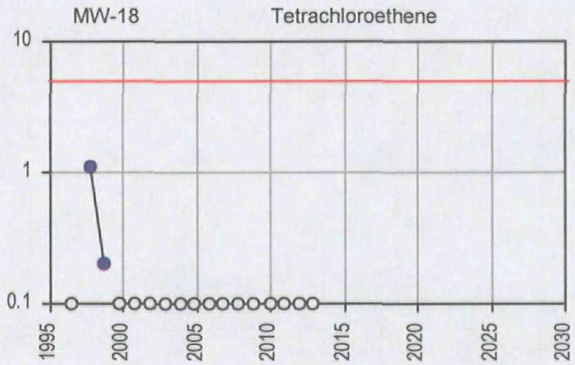

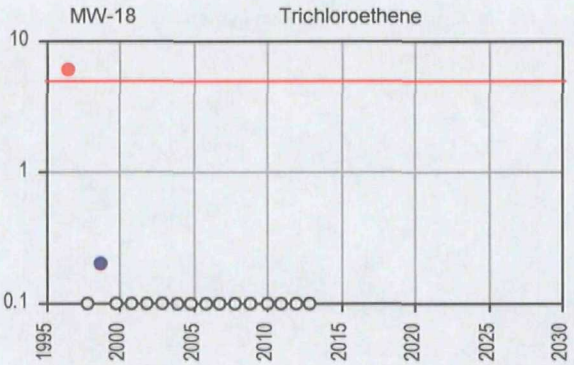

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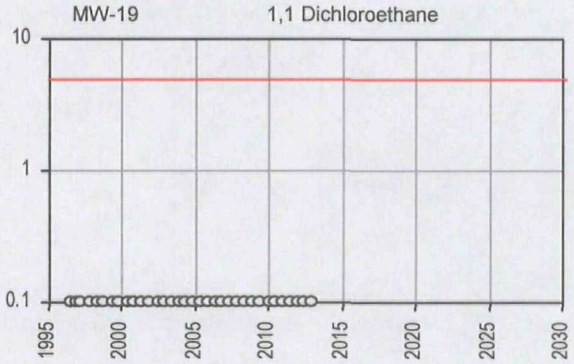

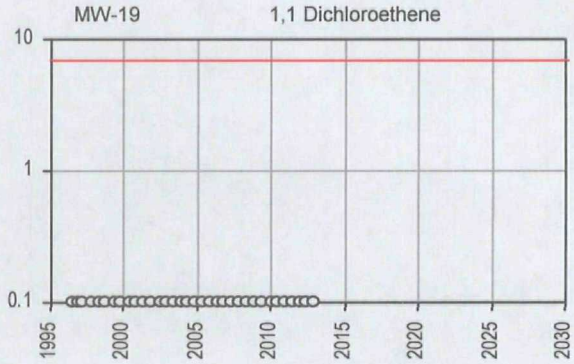

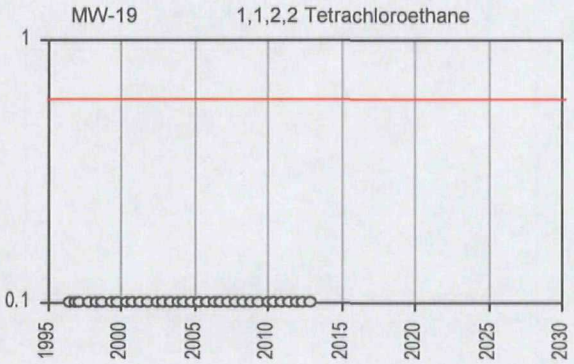

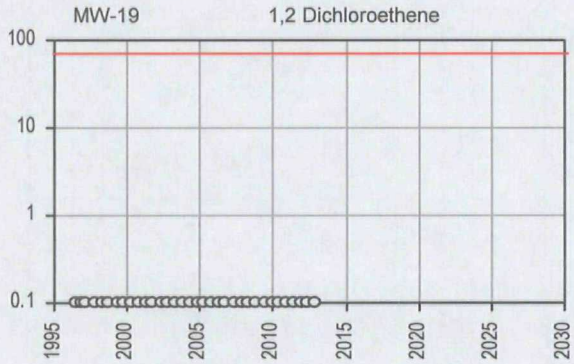

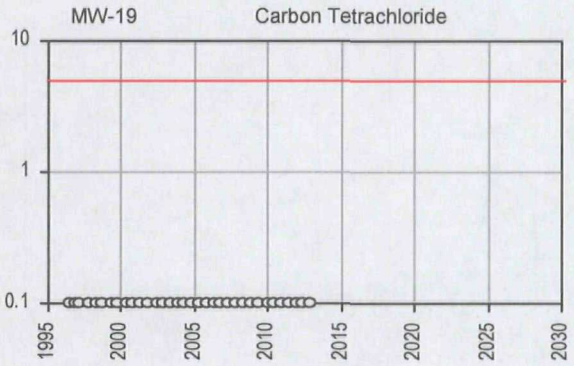

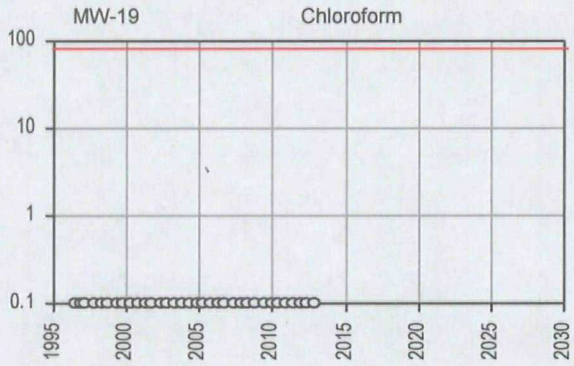

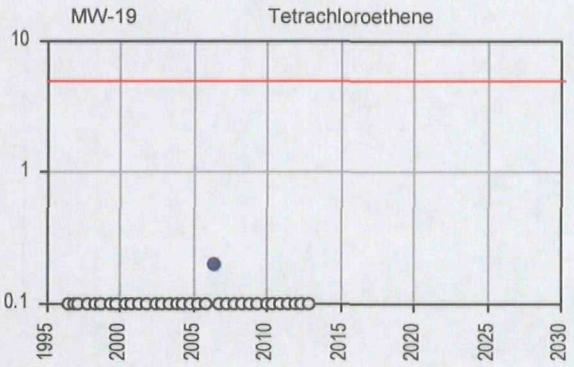

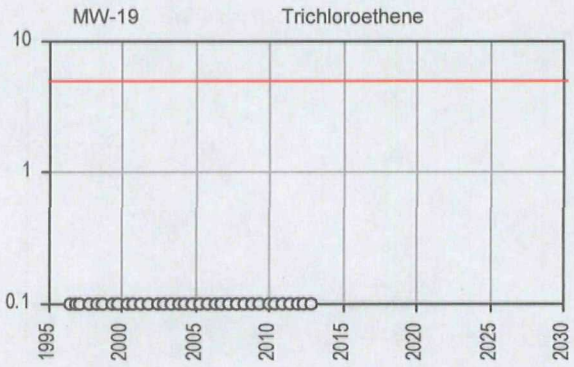

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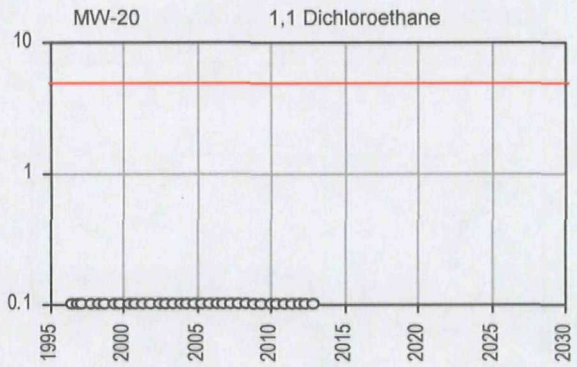
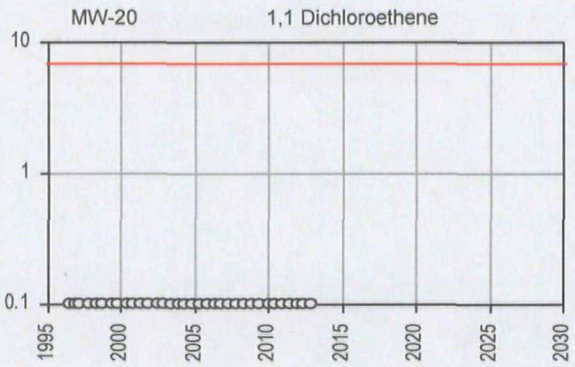
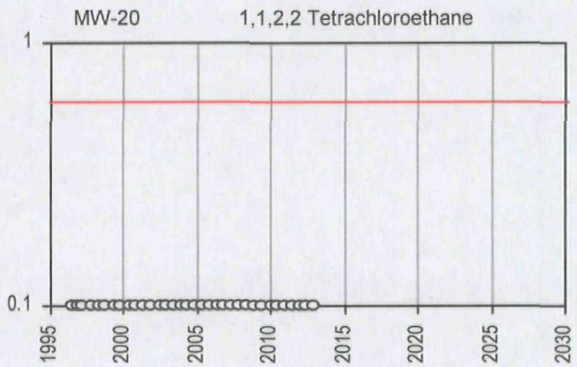
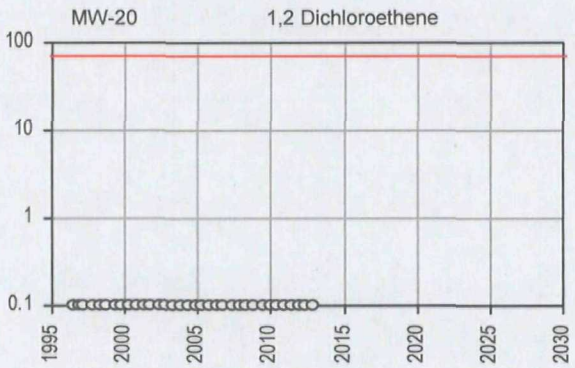
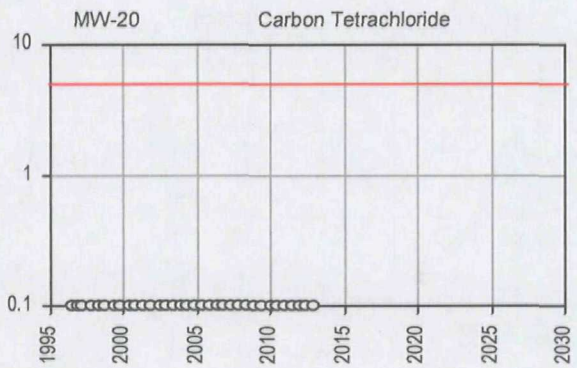
SCRDI Bluff Road - Concentration Trends for Select Parameters

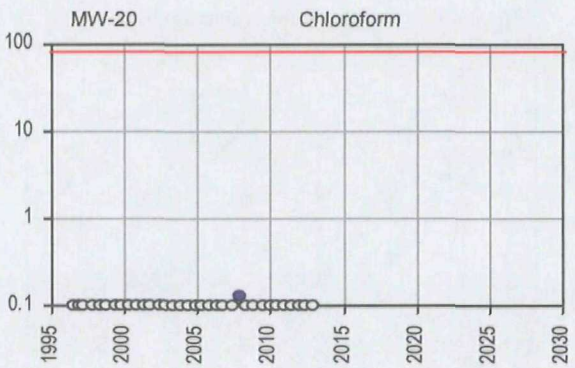


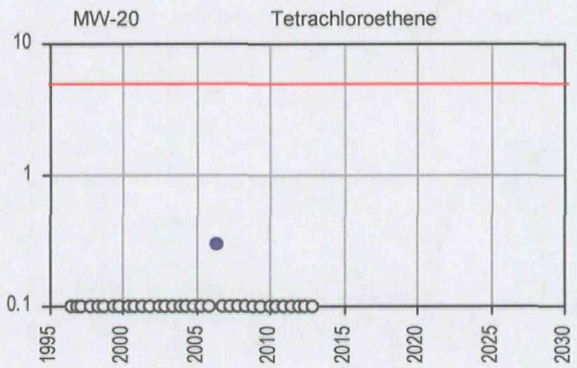


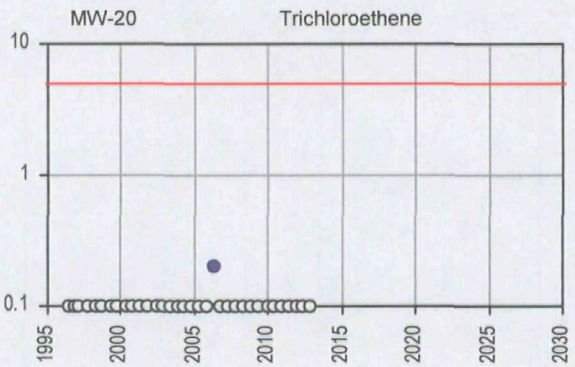












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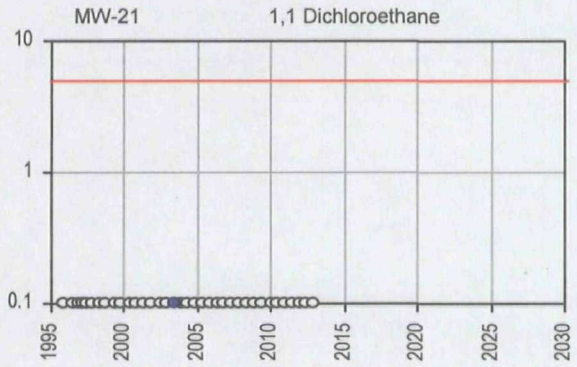

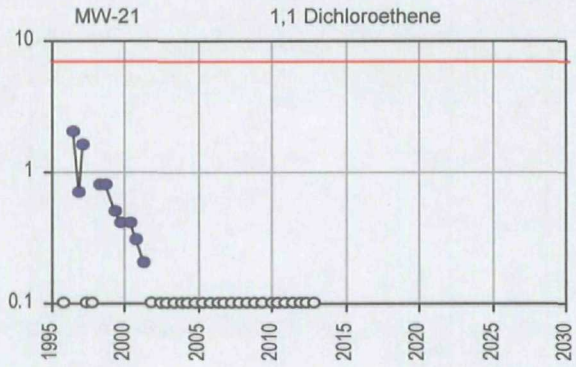

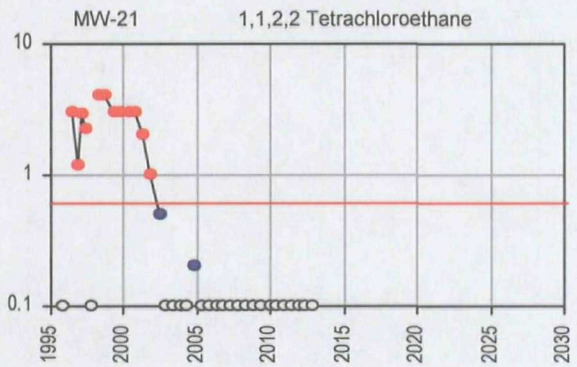

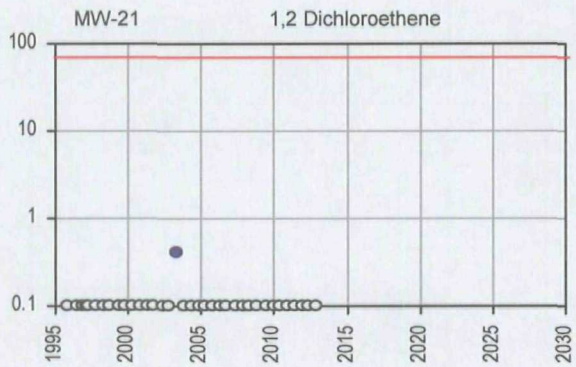

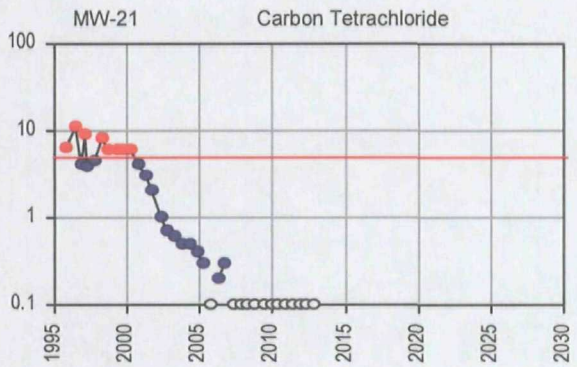

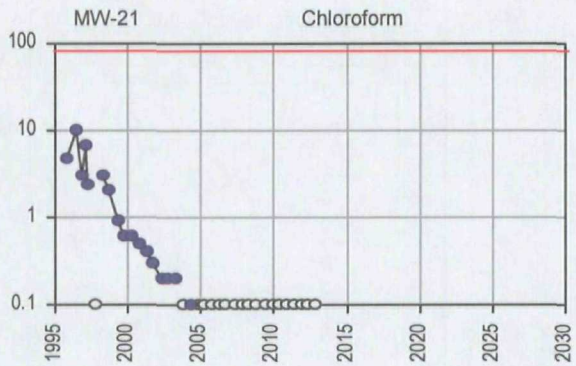

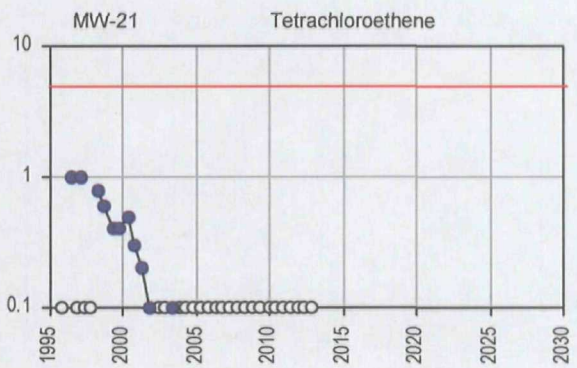

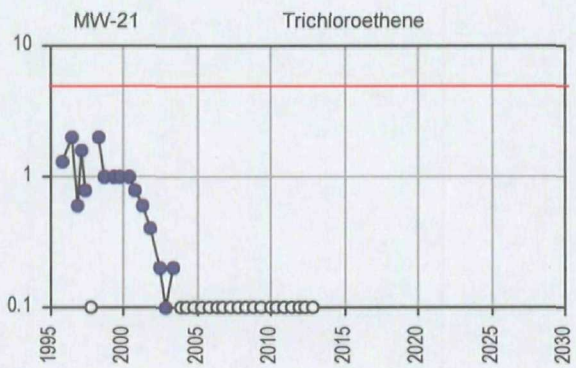

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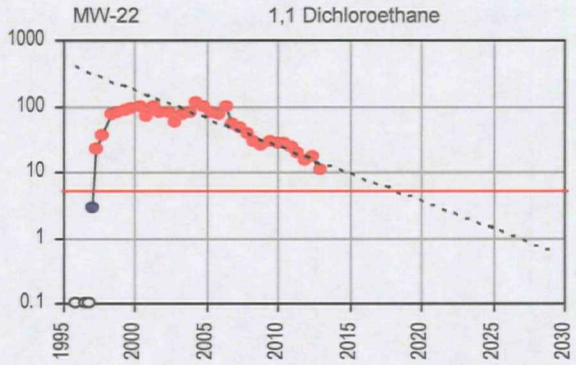

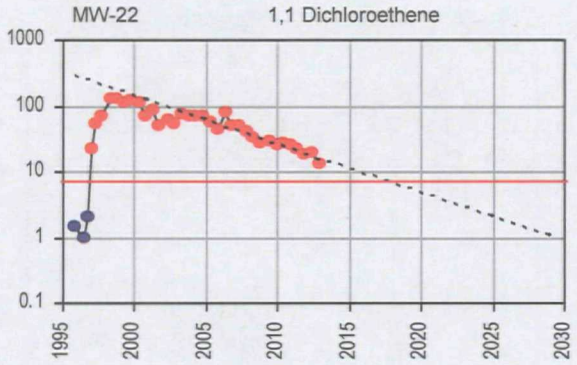

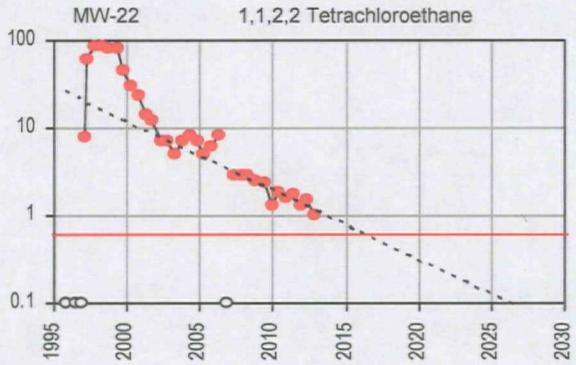

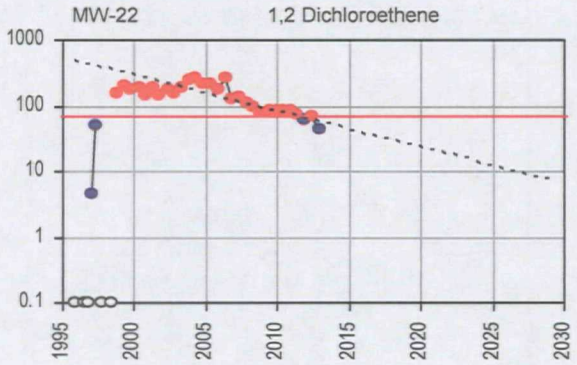

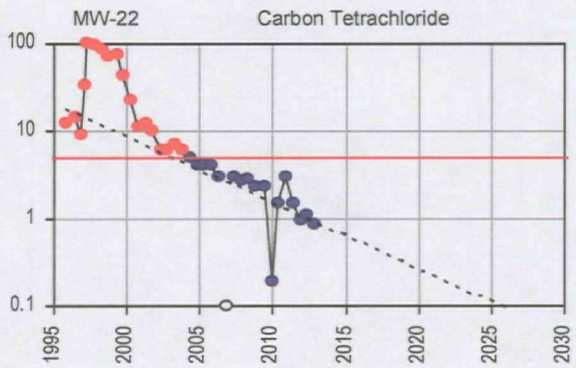

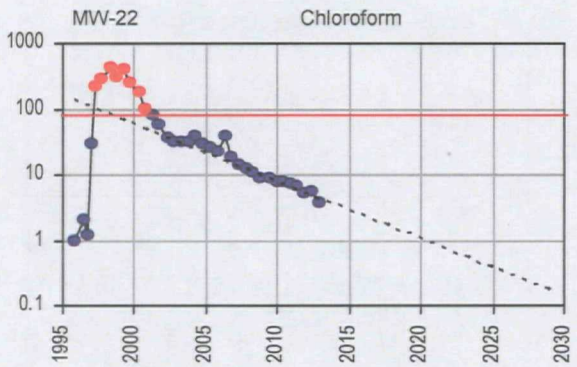

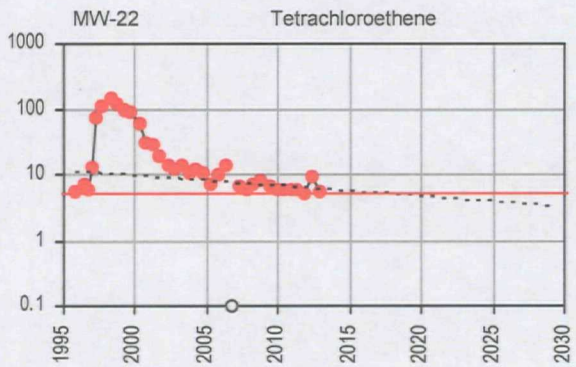

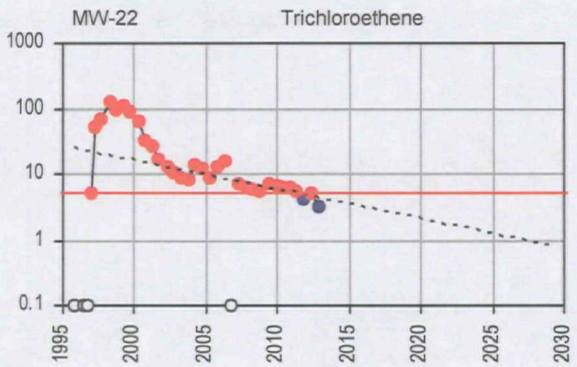

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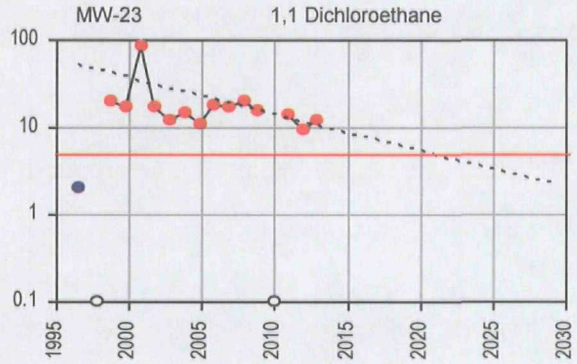

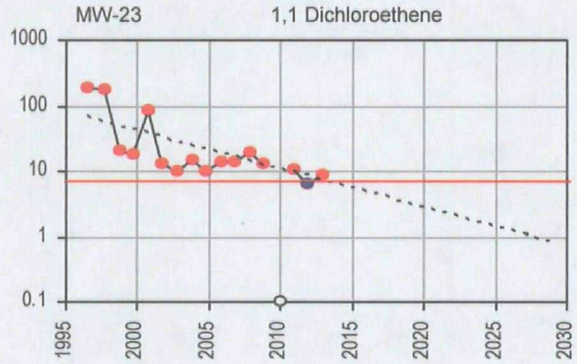

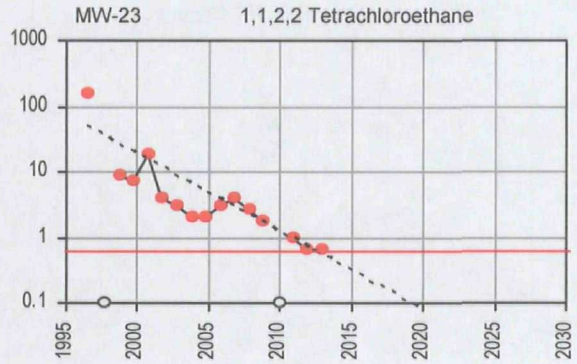

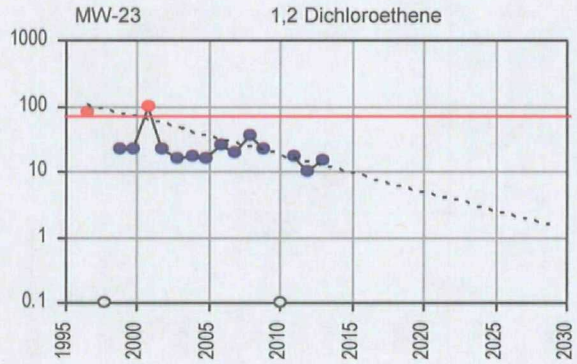

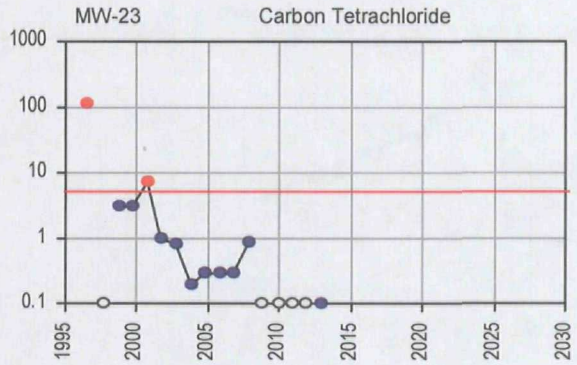

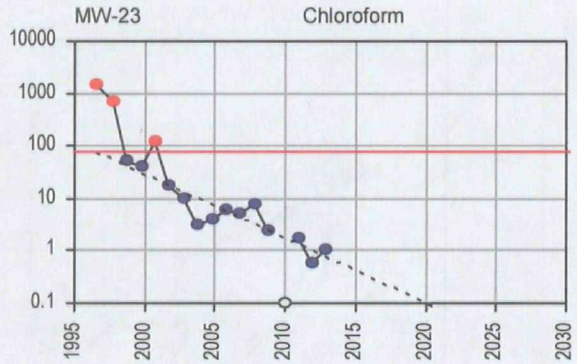

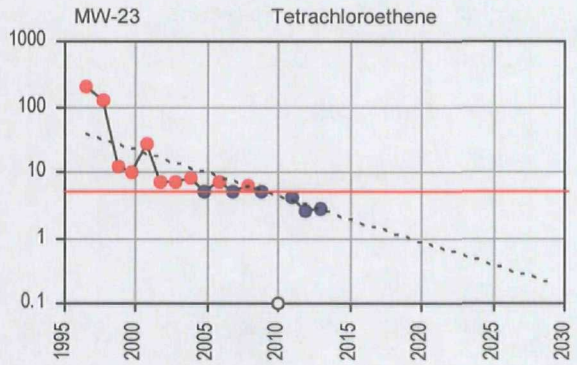

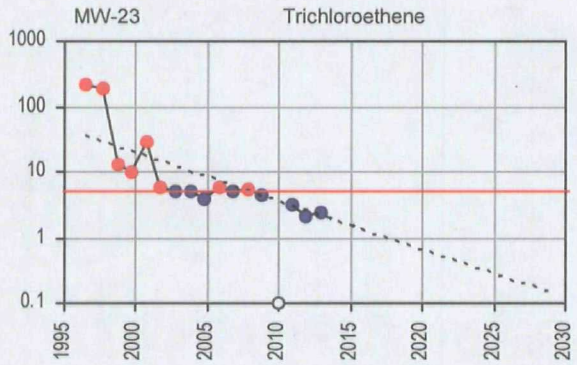

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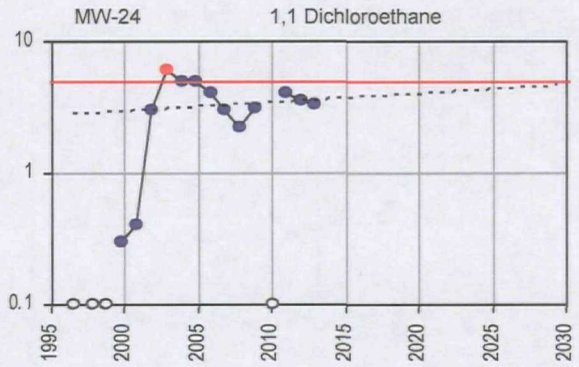

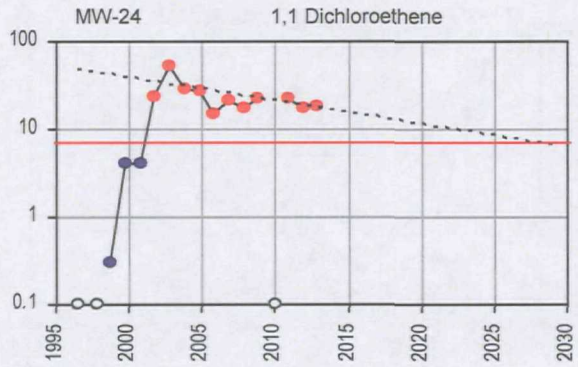

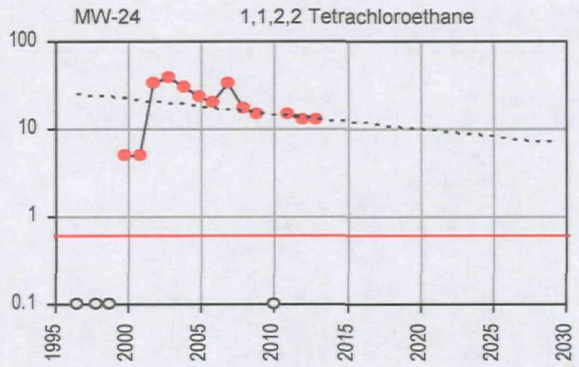

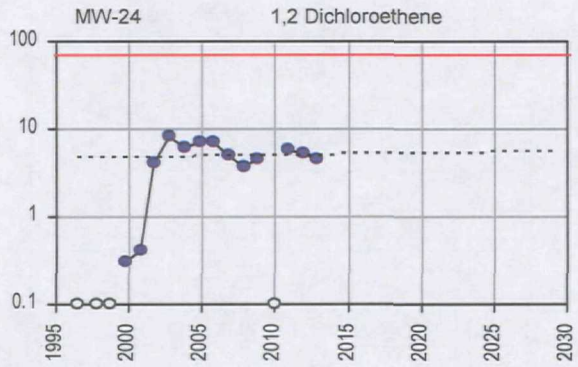

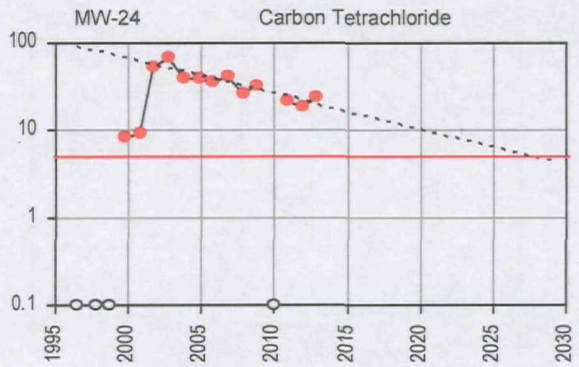

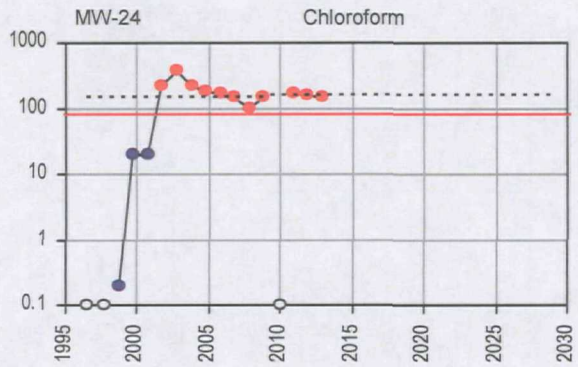

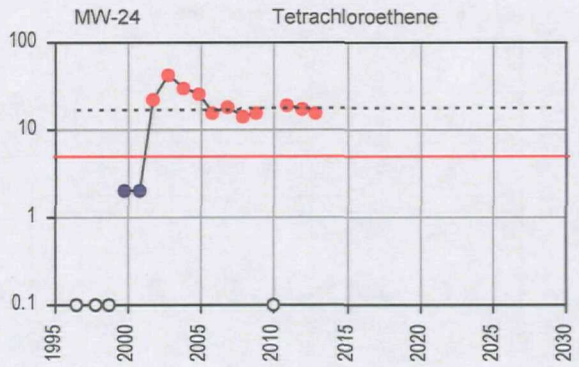

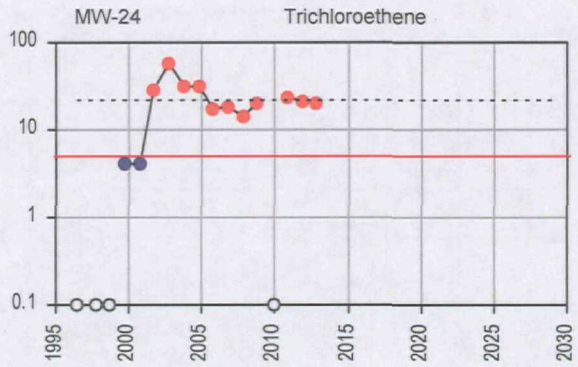

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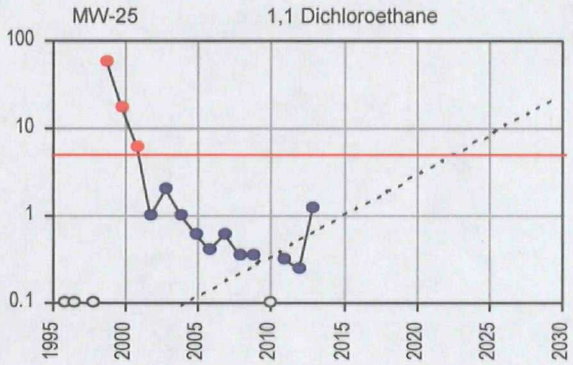

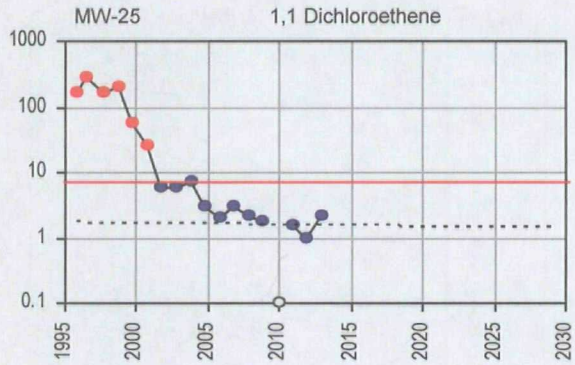

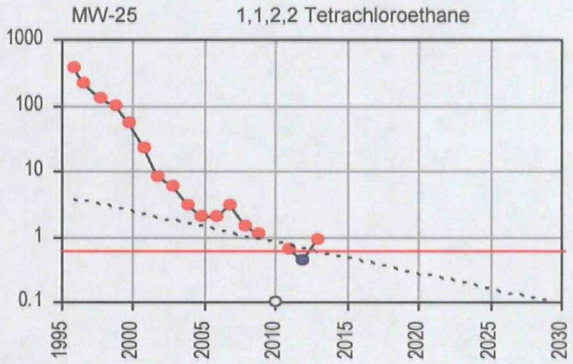

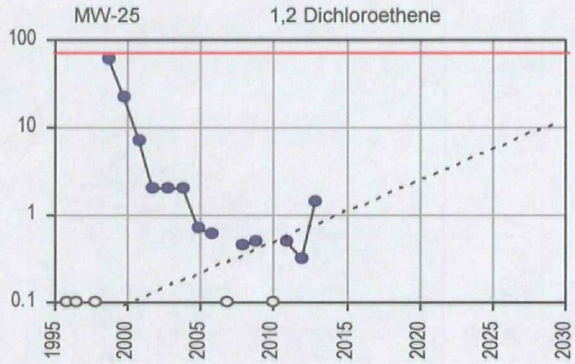

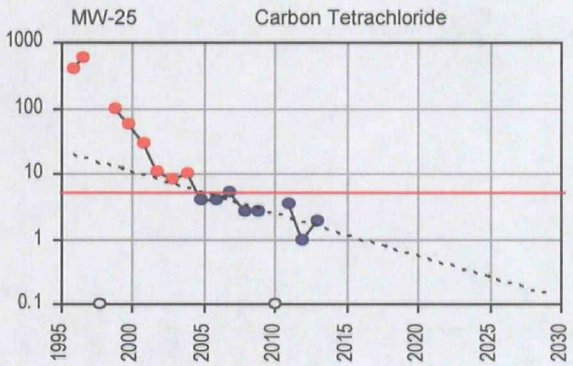

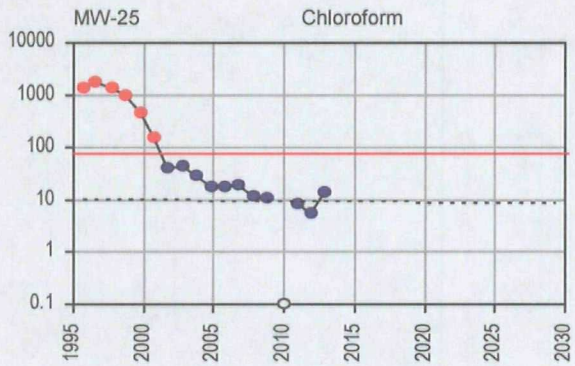

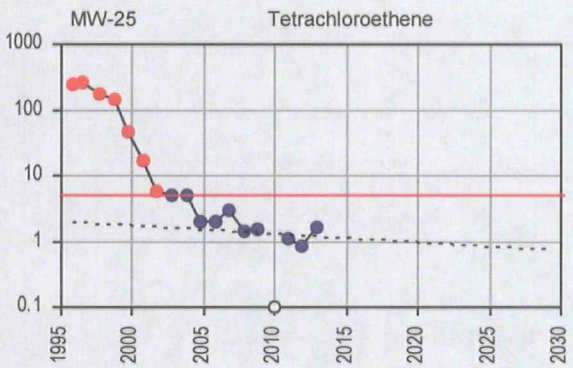

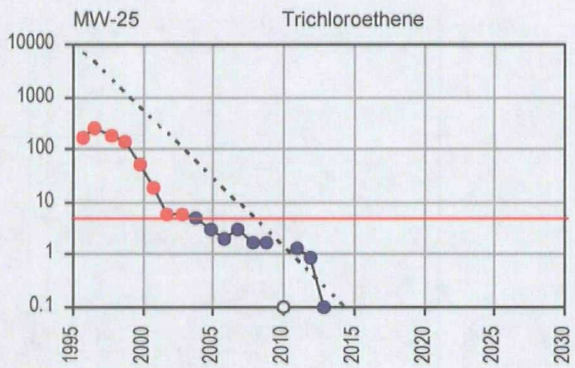

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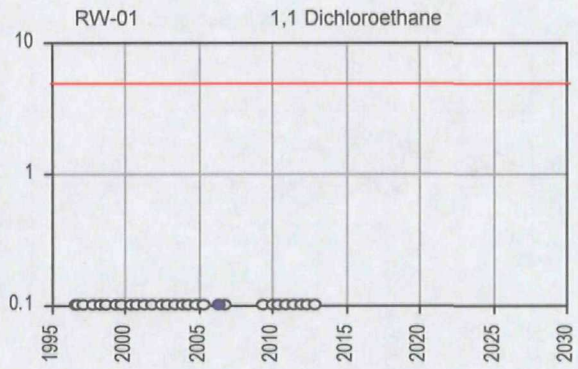

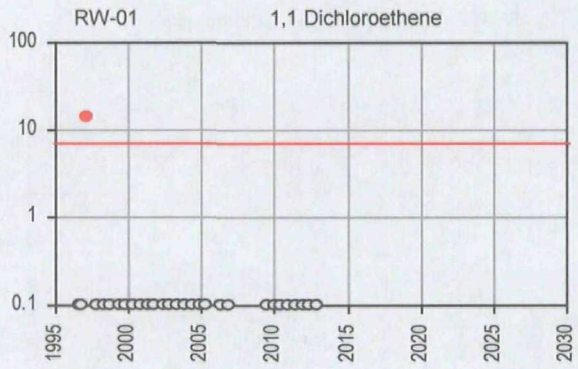

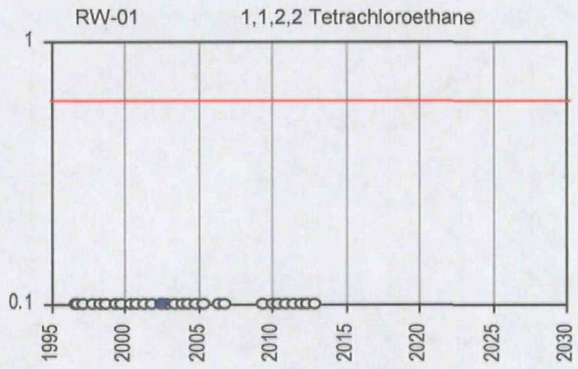

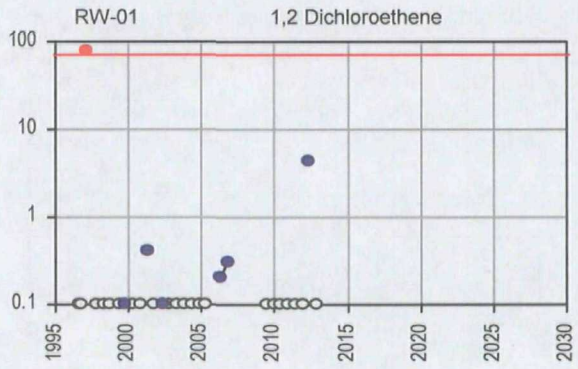

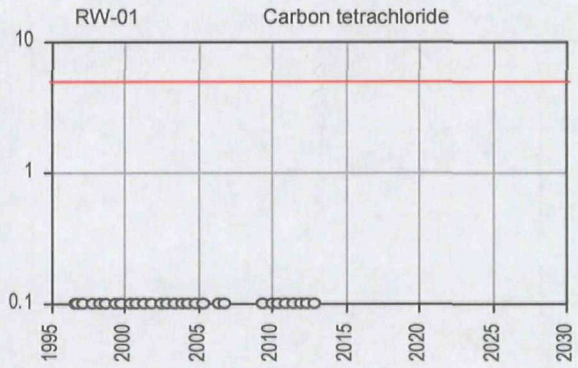

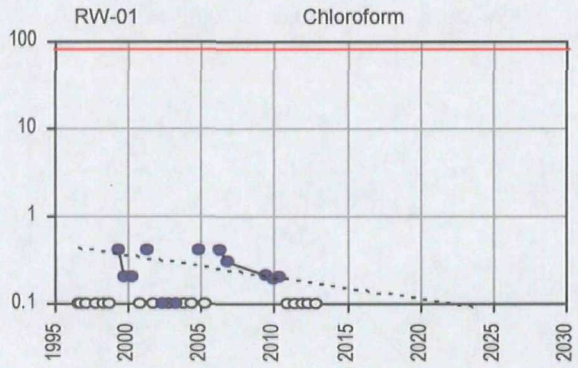

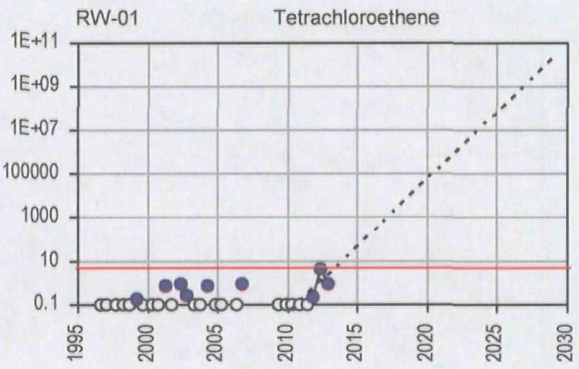

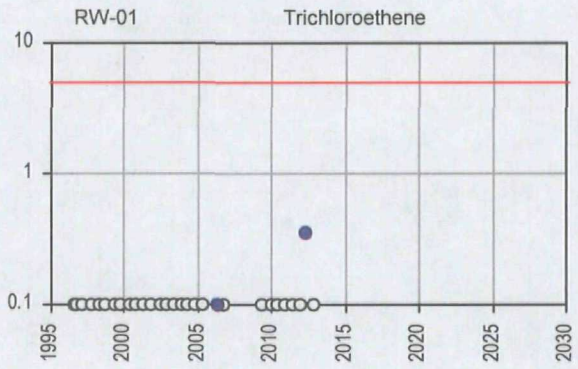

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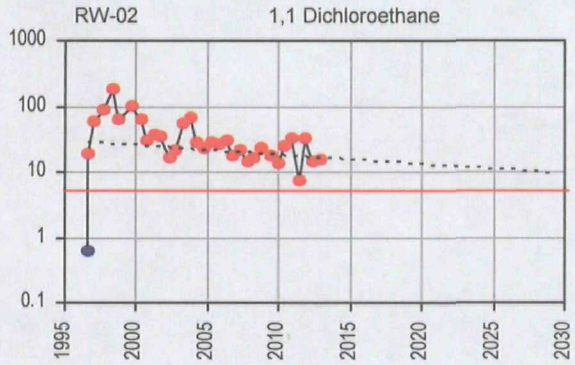
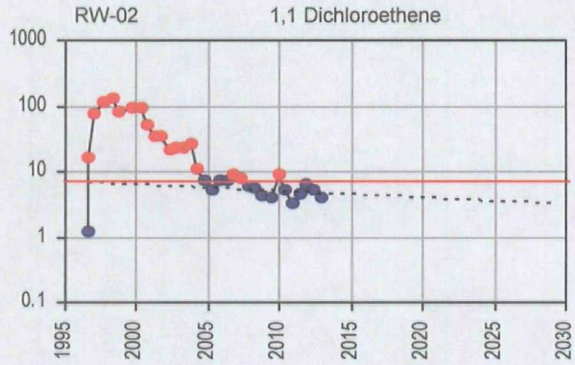
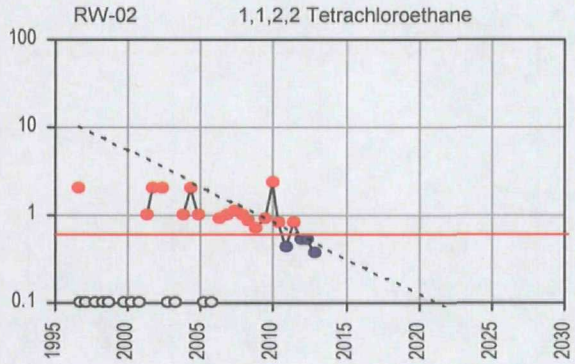
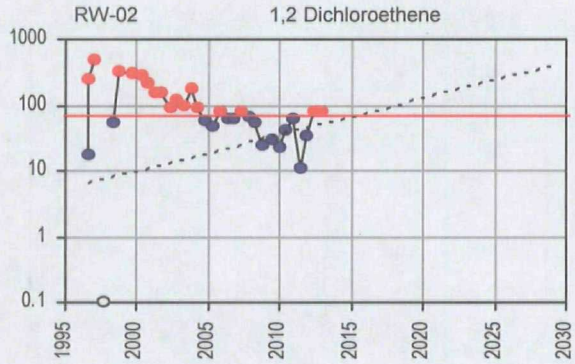
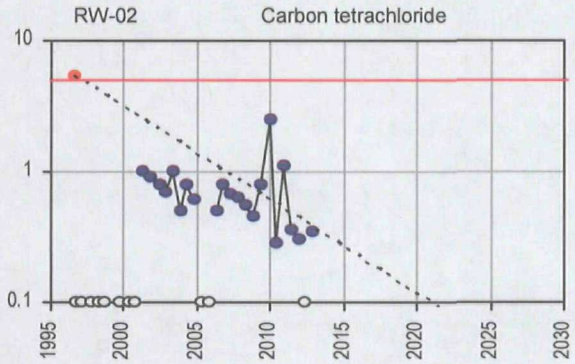
SCRDI Bluff Road - Concentration Trends for Select Parameters

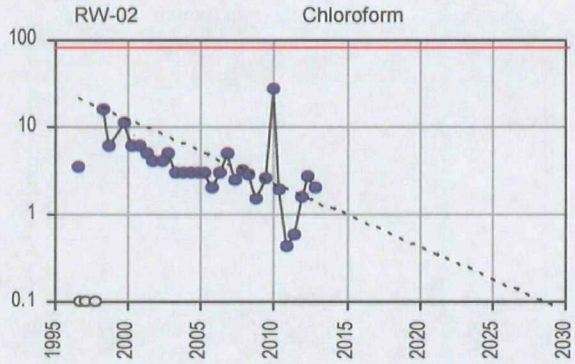


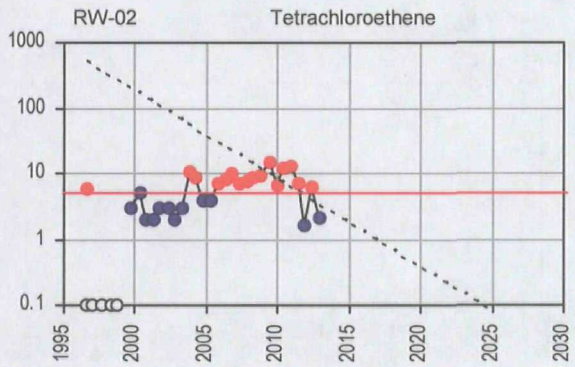


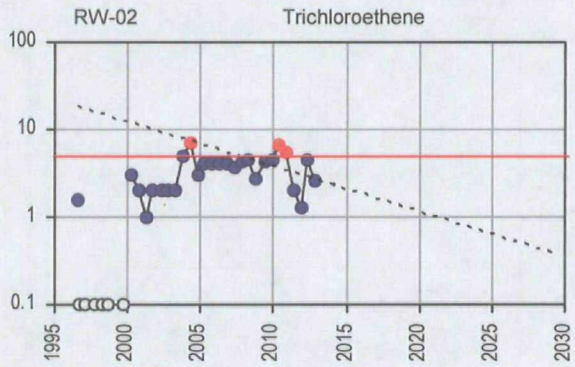












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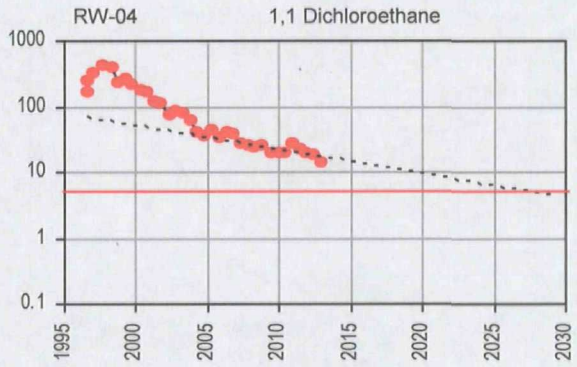

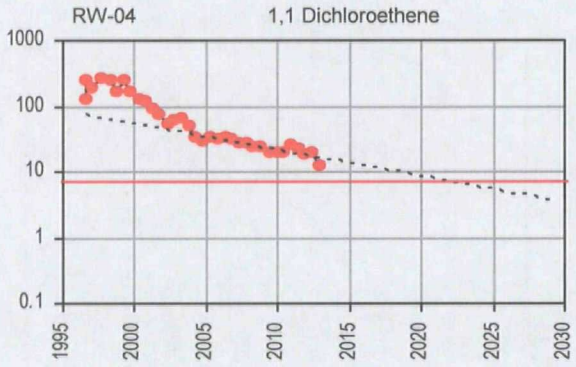

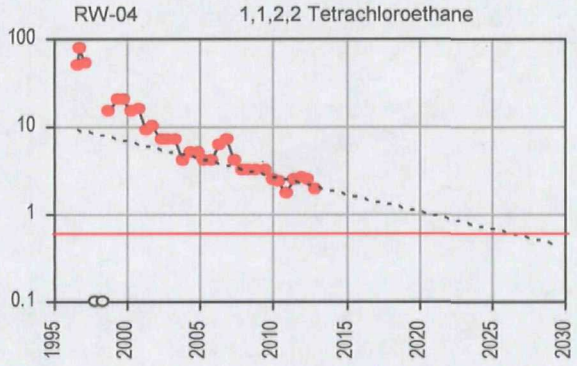

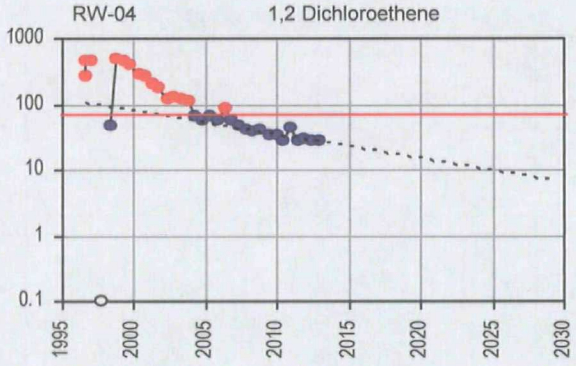

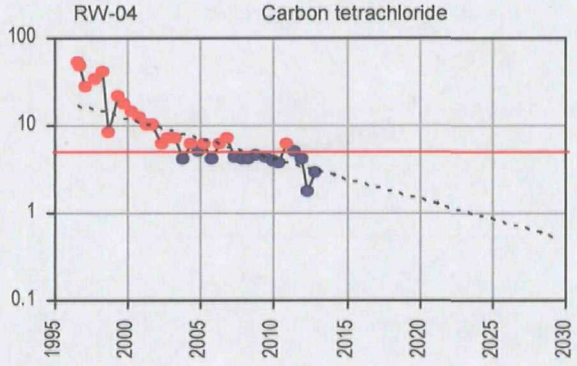

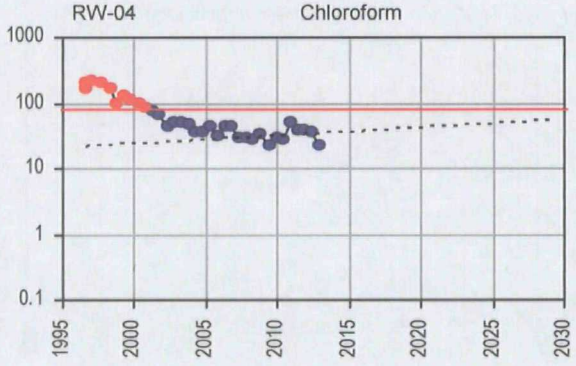

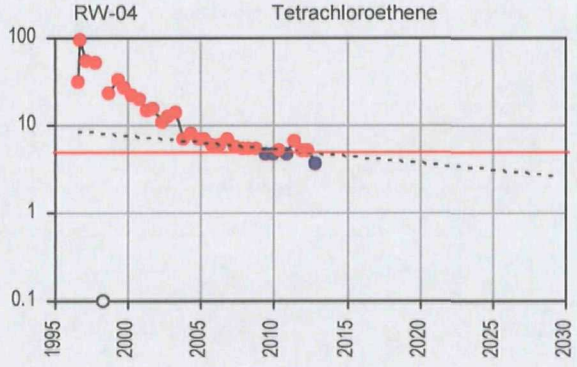

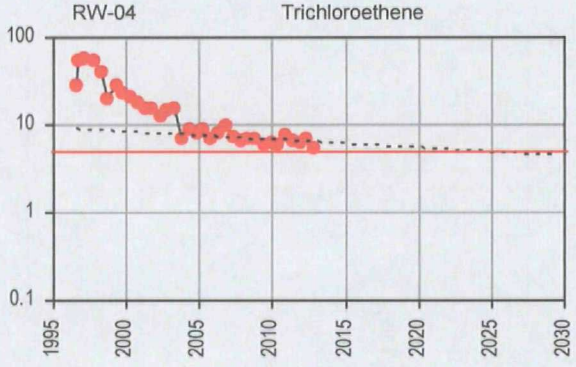

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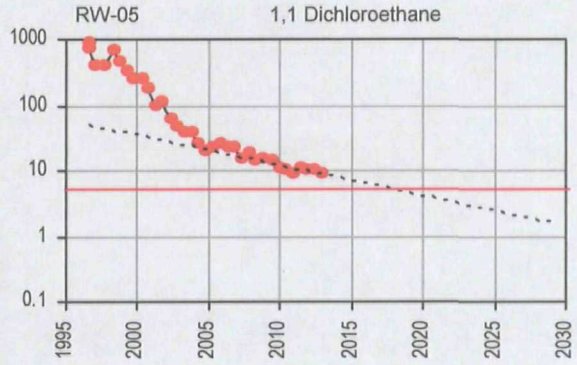

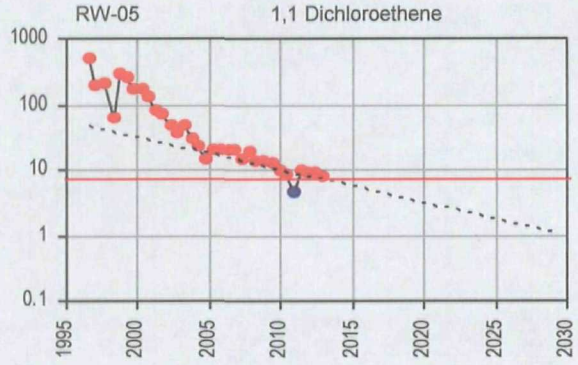

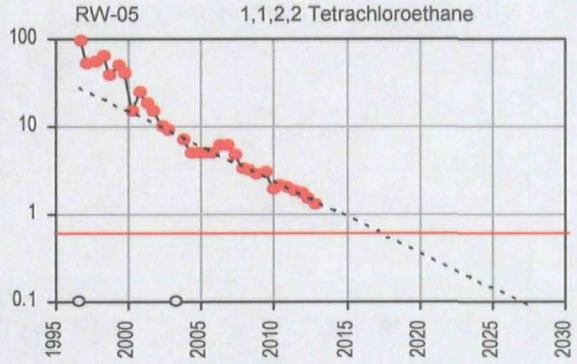

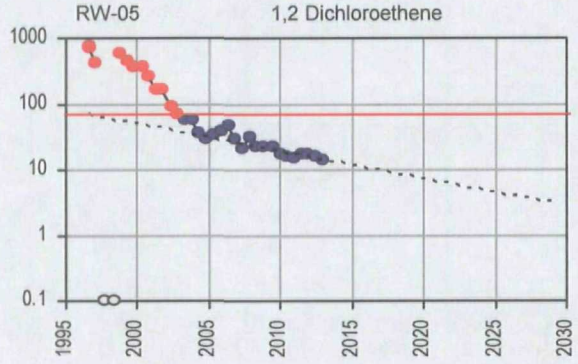

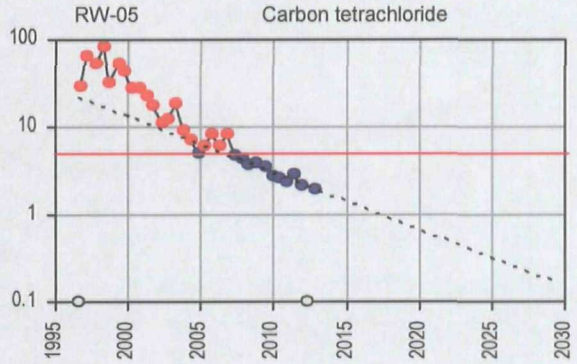

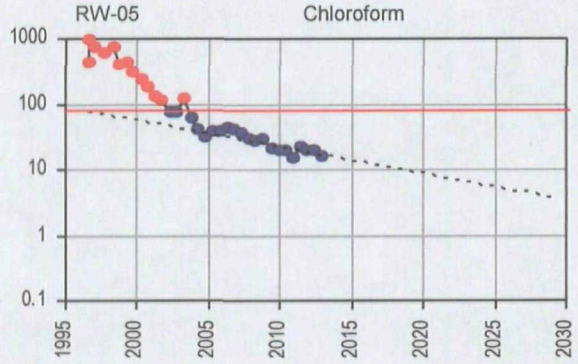

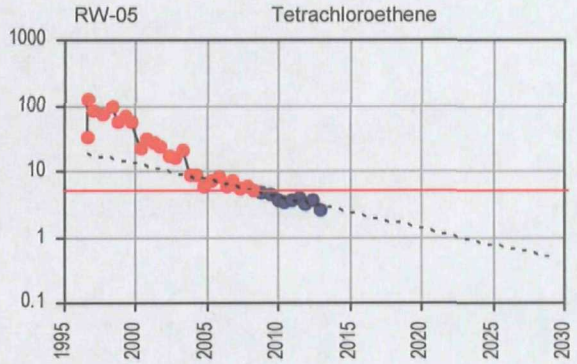

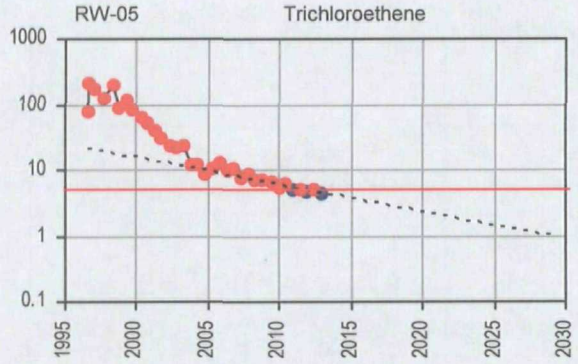

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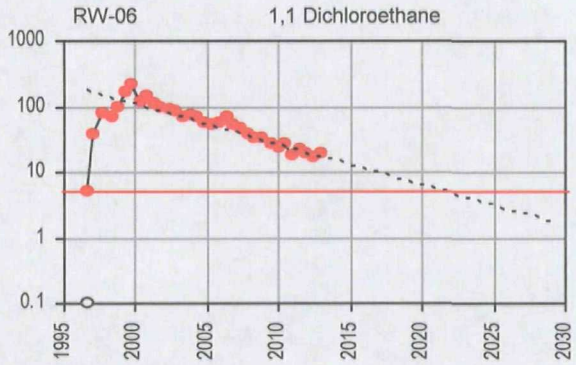

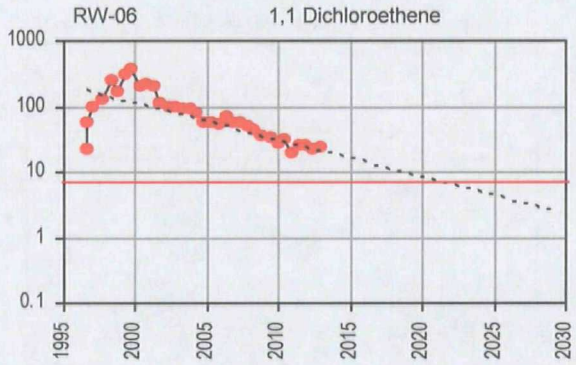

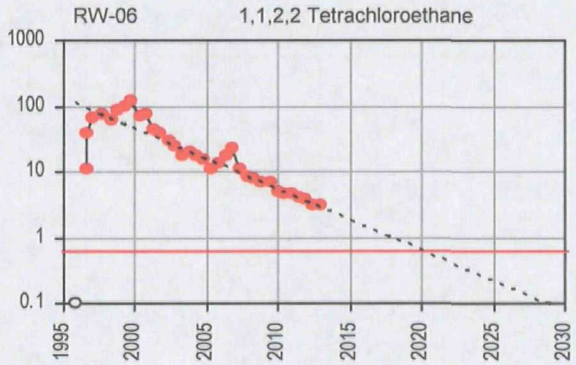

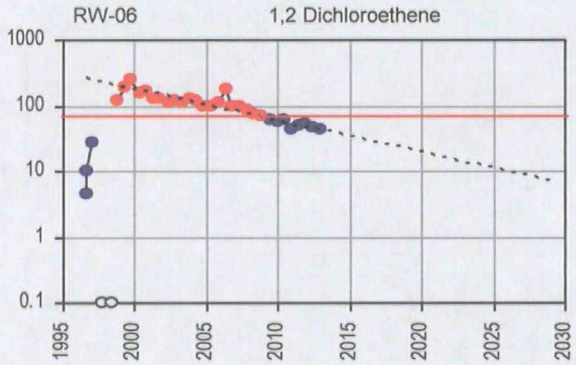

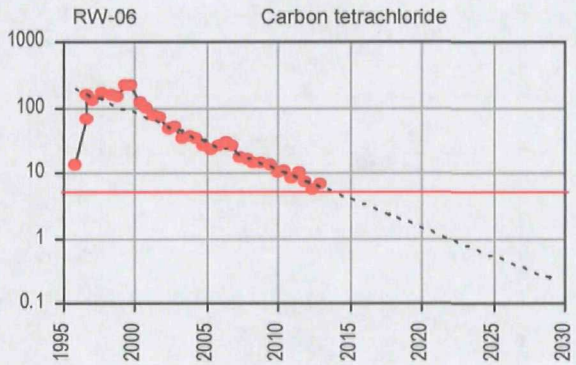

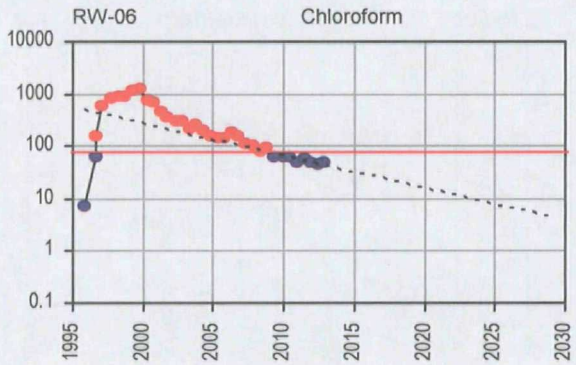

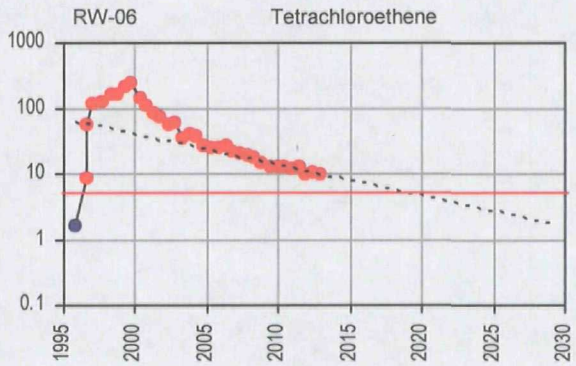

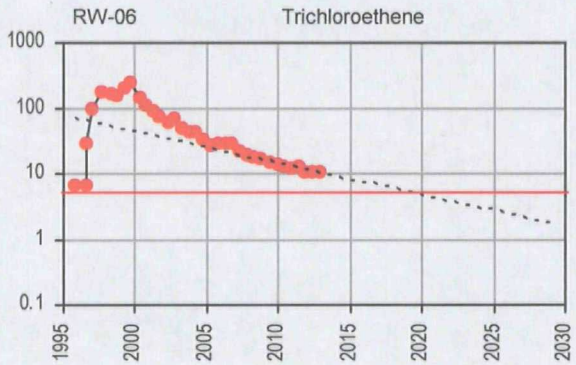

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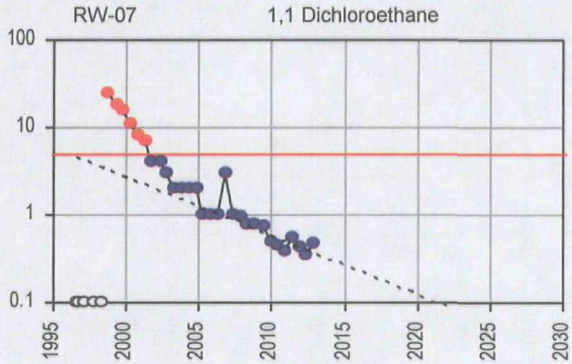

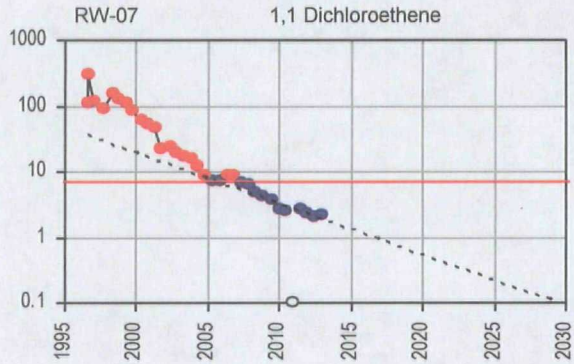

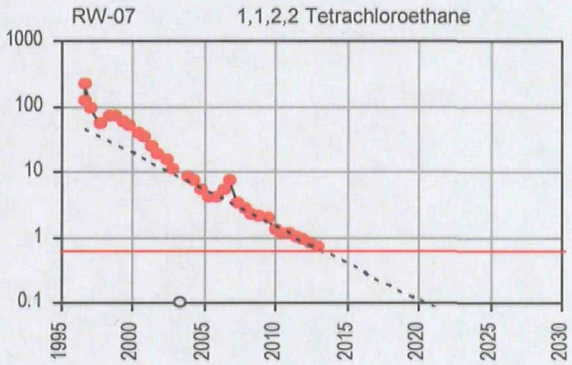

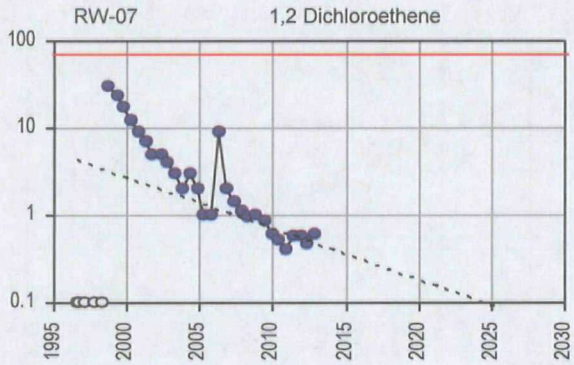

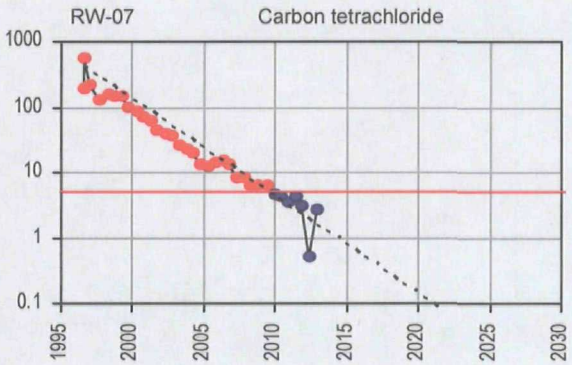

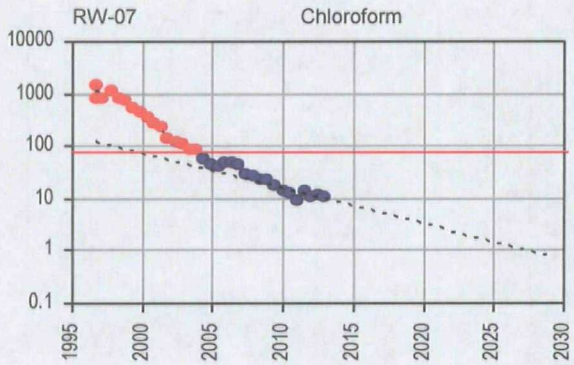

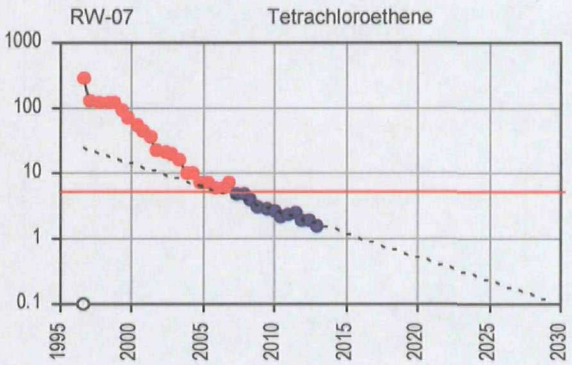

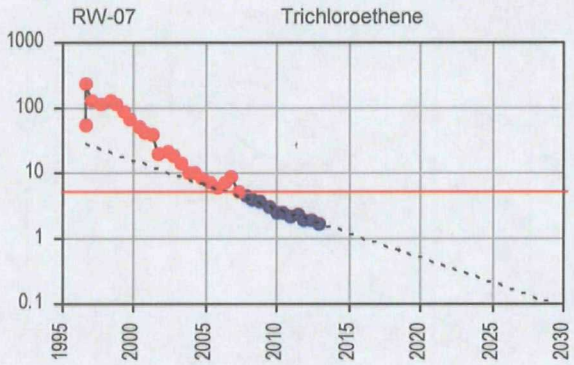

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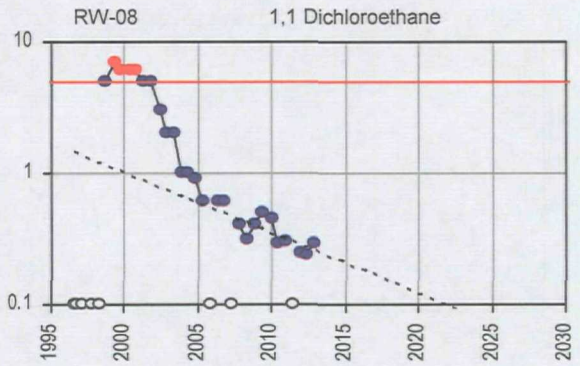

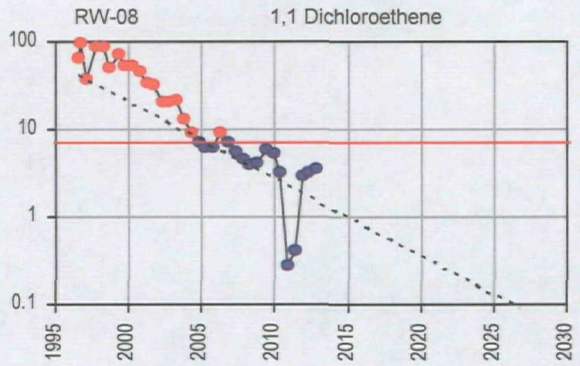

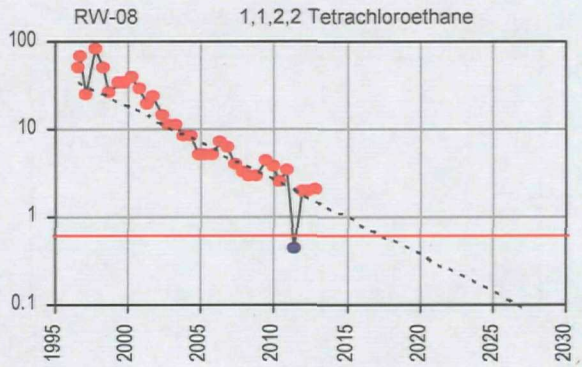

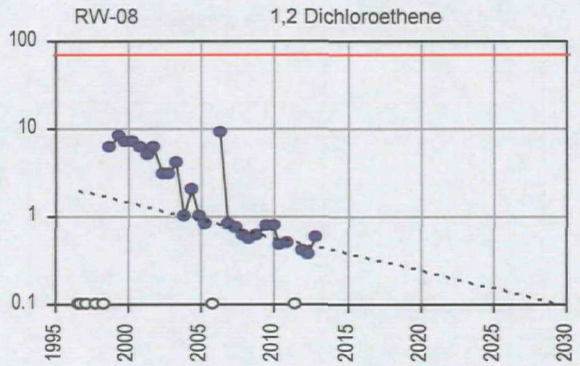

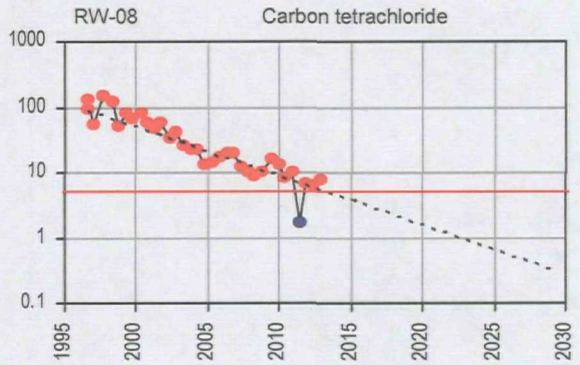

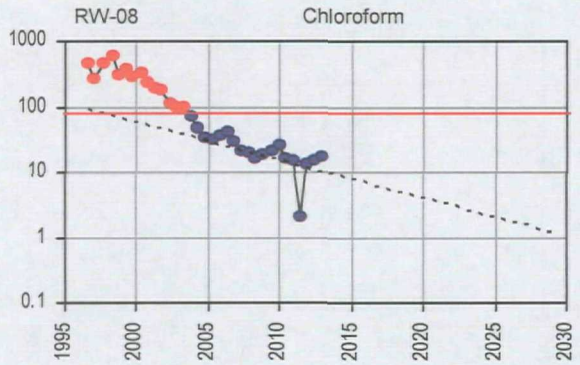

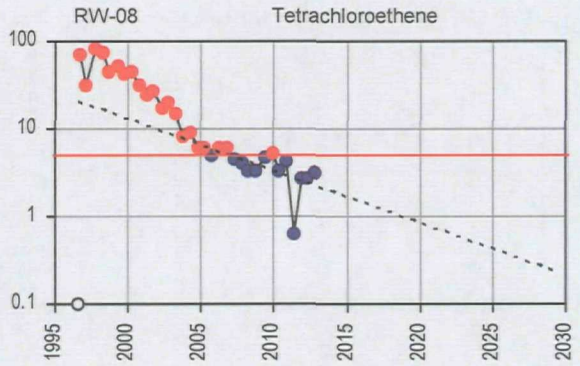

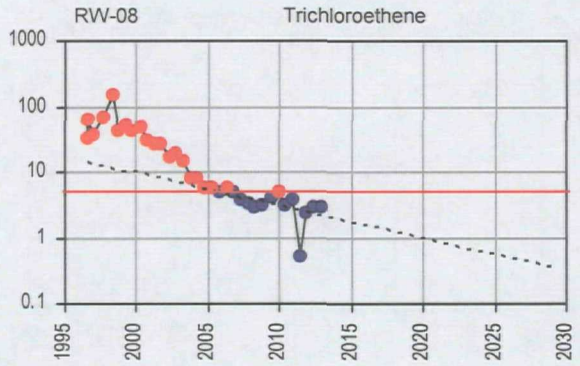

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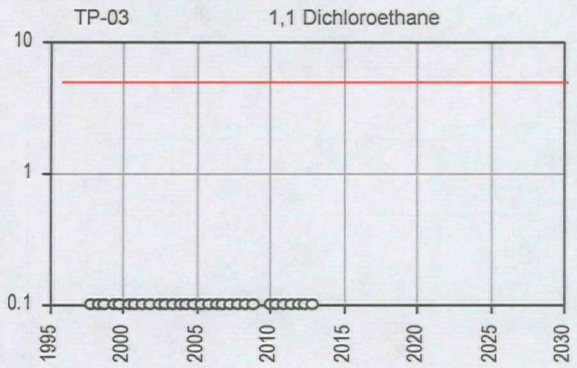
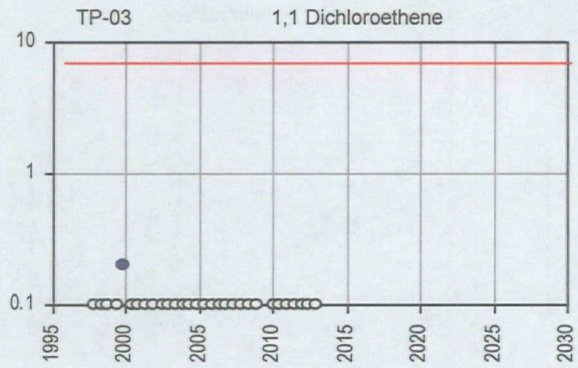
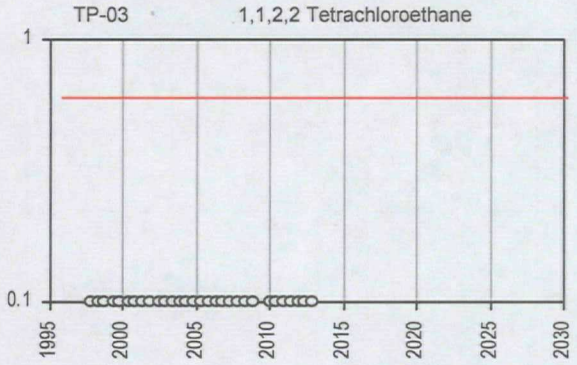
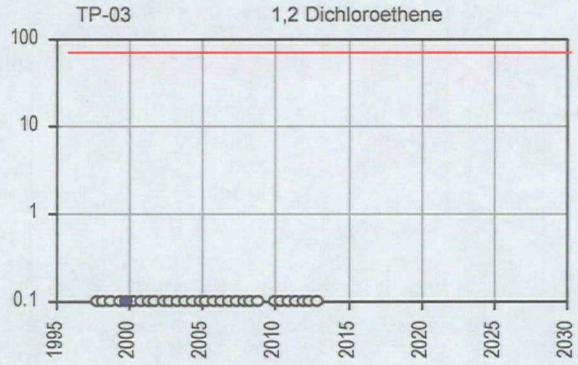
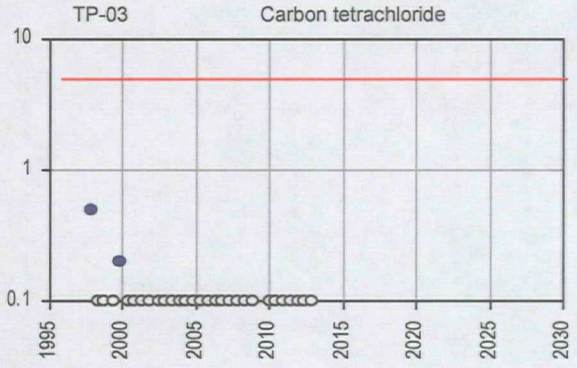
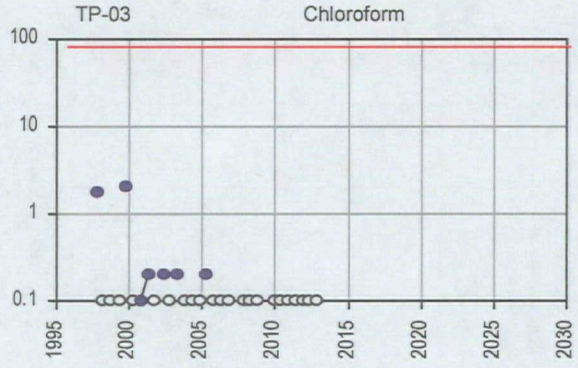


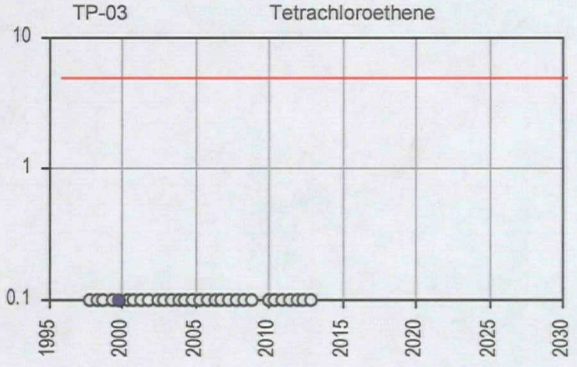


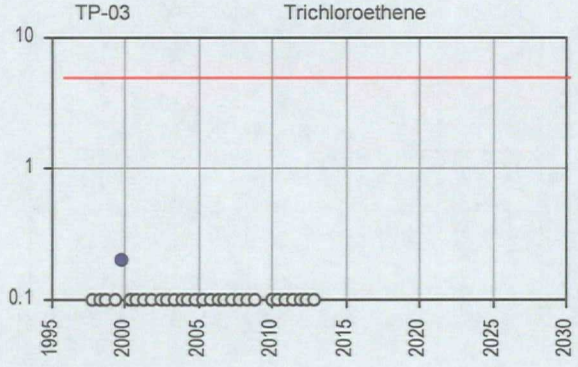






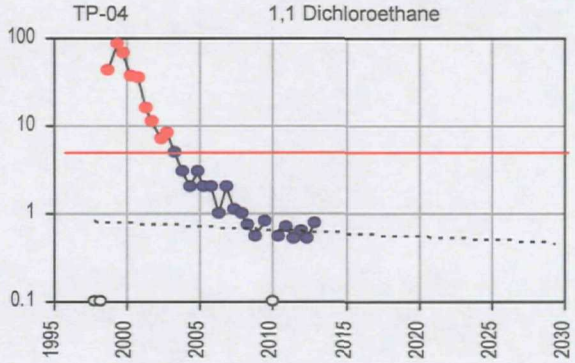


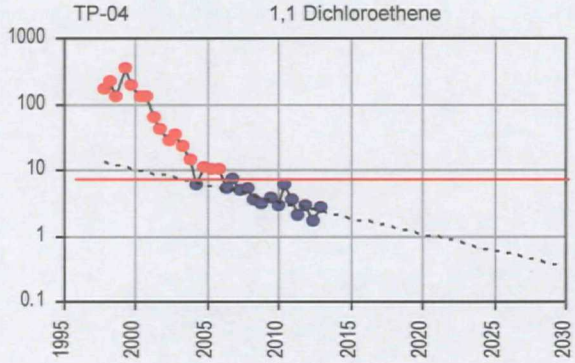


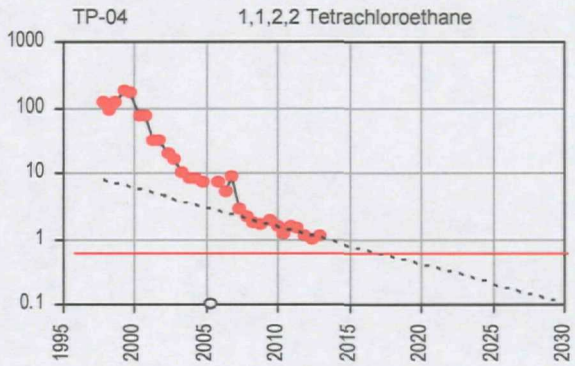


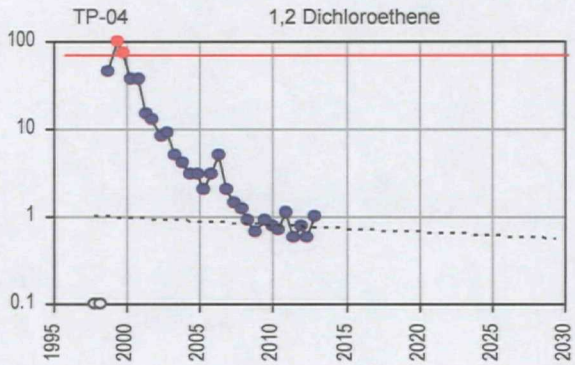
All concentrations are presented in ug/L. 1,2-dichloroethene is total cis and trans
Red point exceed Cleanup Criterion, Blue point are detections at or below criterion.
Non-detect results are plotted as open points at 0.1 ug/L. Red line is the Cleanup Criterion
Dashed exponential trend line is based on last 5 years of data and only detected values.

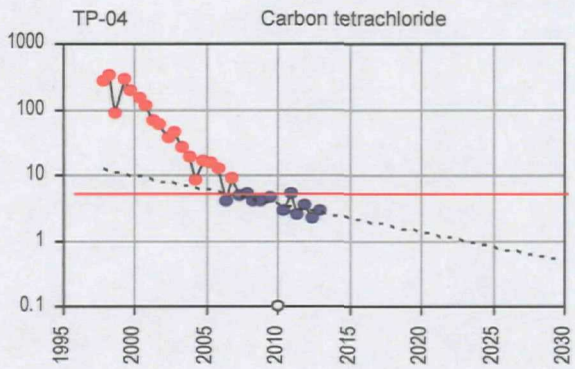
SCRDI Bluff Road - Concentration Trends for Select Parameters

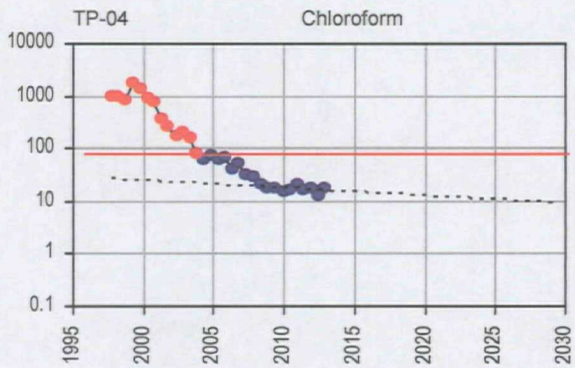


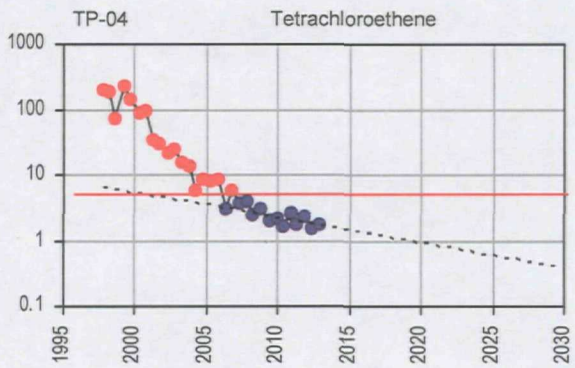


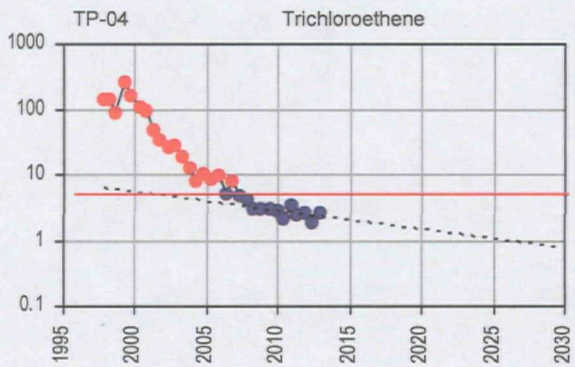












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